RAILROAD GAZETTE

FRIDAY, APRIL 6

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Contributions.

Tests of the Magnolia Anti-Friction Metal.

NEW YORK, March 31, 1888.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I beg to call your attention to a serious error which you have made in describing the result of the test of Magnolia metal vs. Parson's white brass.

You state "All the experiments were conducted on the same two plugs of metal." If such had been the case, there possibly could have been some defect in Parson's white brass which could have accounted for the extraordinary success of Magnolia metal over Parson's white brass. This was a point carefully considered by the engineers in charge (than whom there are none of higher skill) in making the test.

There were *four* different plugs of Parson's white brass used and four plugs of Magnolia metal. The Parson's white brass was bought from the accredited agents of that metal at two different times.

If you study carefully the test in detail (on page 11 of your March 30 number) you will observe that Magnolia was tested against Magnolia and Parson's white brass against Parson's white brass. This was done to prevent any possible mistake that might occur, in pouring or casting the metal.

Kindly correct this error, which I have no doubt is a *lapsus pennæ*, and oblige,

MAGNOLIA ANTI-FRICTION METAL CO.,
CHAS. B. MILLER, Prest.

The Duplicate Order System.

PITTSBURGH, Pa., March 26, 1888.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Noting your extract from a Southern dispatcher's letter and your comments on the same, I must, in the name of fair play, protest against the practice of this correspondent being brought up as an argument against the plan I advocated. In the first place we would insure the delivery of all orders under the conditions he mentions at the terminal referred to, by changing the mere instructions to train men to report at the terminal office before departing to a positive time table rule for such trains as are generally late, or invariably get orders at that point, to "not leave —— without orders;" then dispense with the hold order to the terminal operator, but place in his hands for delivery duplicates of all orders in which trains starting are interested, canceling, if advisable, any that are fulfilled before delivery. Under the operation of this rule, the train thus desired to be held could not start from the terminal without orders of some kind, even if the orders only read, "No orders for train ——."

In opening this discussion I made the distinct statement, "Of course the operator at the point where the train is held for orders holds the duplicate of every order given to inferior trains," and I gave no intimation that we in any manner used the advance order to hold a superior train while moving inferior trains against it on single orders. Because an advance order is used is no reason why the principle of the duplicate order system should be violated. On the contrary, as "Superintendent" says, both systems may be used in connection, the advance order tiding over the weak place in the use of the duplicate left by the "whenever practicable" of the uniform code. The use of an advance order by a dispatcher should not lead to any more inclination on his part to disregard the rule requiring duplicate orders than to disobey any other rule. As Rule 510 now stands, is not a dispatcher often tempted to disobey the direction of the first paragraph and give "complete" to the inferior train when he cannot at the moment get the other office to place and "o. k." the order for the superior train, and under the loose practice which this rule teaches, is not this often done? Again, if the rule is a good one, does the existence of this temptation condemn it or render it the more dangerous?

No matter how good a rule may be, if it is not lived up to it is worthless; and your correspondent's practice, as well as your own inferences, would not be carrying out the advance order system, as I stated it. The only practical objection to it is the one you make in regard to multiplying stops; but bear in mind, we do not claim this order should be used to the exclusion of other orders as circumstances may require; and for the trains you refer to, I think an order given at the starting-point to run late, making proper allowance for the time likely to be made up between certain points, would be the order best suited to the case. But if absolutely necessary, we would prefer to stop the train rather than to take the risk incurred by placing undue responsibility on operators; if both speed and safety cannot be insured on a single line without resorting to the dangerous practice of "running by orders and getting no orders" or some other equally hazardous way then sacrifice the speed or build double track.

For, get what signals you may, govern their use by rules positive as you will, with training and supervision of the best, you still have but the vigilance of the *one man* in charge of each signal between you and disaster, and that this vigilance is often relaxed is shown by the yearly increasing number of butting collisions.

ORDERS.

The Stadia in Railroad Surveys.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Fourteen years ago the writer heard expressions of surprise by the late Col. F. U. Farquhar, U. S. Engineers, that the use of the stadia was not more general in railroad work and profited by the hint. He is glad to have Prof. Johnson call attention to the same subject. It has not, however, appeared that the best use of the stadia is in taking topography, and the writer still believes that with a skillful topographer other methods are more economical of time, and as satisfactory in results. Experience, however, shows the difficulty of securing the requisite skill, and reliability is secured by the stadia even in the hands of a novice.

Professor Johnson names three way of selecting a preliminary, and passes unequivocally on the comparative value of each. It is doubtful if any one can arrive at such a definite conclusion till he knows the conditions of territory to be developed. *Like* results may be reached by all these methods, but what are *best* may depend upon the individual judgment of the engineer. The writer thinks he has seen time squandered by an elaboration of work on a single line, in an open, or prairie country (not necessarily easy), which might have been saved by a diversity of trial lines, simply because less time would be consumed by the party in running the lines than in waiting for the topographer and draftsman to do their work. It can be said that rarely does any method become entirely obsolete, as the time is likely to come, in ordinary experience when it will prove its right to be chosen. The stadia will find a place of importance in the experience of almost any engineer.

In a reconnaissance of a long line of diversified character, part of which requires only to be ridden over, with distance estimated by knowledge of points on a map; or by odometer attached to a wagon wheel; or even by timing the gait of a saddle horse, there will occur points of difficulty, and a question of ruling gradient as well as probable cost of construction will arise. The engineer may then require transit, rod and picket; and as a party, a rodman, flagman and teamster.

Suppose the country to be open—a prairie:

If the engineer cares to rely upon his "eye for country," he may guess at elevation and length of planes, and so arrive at gradients necessary to assume. It is better, however, to guess at elevations by aid of an aneroid, and make some kind of a measurement of distance. Starting from summit he assumes a cutting, sending his rodman to spur below. With vertical limb of transit set at proper angle for assumed grade, where centre cross-hair cuts rod determines cut or fill of point No. 2, to which he gets stadia distance. Leaving flagman at point No. 1, and having instructed his rodman how to move, he sets transit at No. 2, and fixes No. 3 with reference to grade, measures distance to it and horizontal angle as before, continuing process to foot of plane and to end of line requiring instrumental work. He has thus tested the adaptability of gradients, measured horizontal angles and distances, and has a line he can plat. In walking directly from point to point, he can make some estimate of intervening cuts and fills.

Again, suppose one has worked up and mapped his belt, and laid his line of location on paper, but wishes to solve a doubt about something outside his map. Leaving remainder of party to work on location of line, he can impress his teamsters and watchmen, if he may not take his topographer's assistant, and with his duplicate instruments solve his doubts without loss of time to the party.

Sometimes booming cities require special treatment, and real estate values settle many engineering questions. In a suburban tract barely platted for record, and where, possibly, street lines are defined only by brush cuttings and block corners, prices are so sensitive that a line of railroad stakes would have an appreciating effect upon what a company might want. The writer, in such a case, has used a stadia party so small as to have it mistaken for town site surveyors, or a detachment from the city engineer's office. A preliminary was first run, with stadia measurements, the instrument points only appearing on the ground. Angles were measured, and line tied to a few block corners. Next appeared the level party, the rodman pacing distances for regular stations between stadia points. Then the topographer and his assistant did their work in like manner. Resulting was a line that was plotted on same scale of an existing city map. On this was topography, and location proposed, of which a profile was made from contour elevations. A vellum tracing of this, applied to city map by ties at block corners, showed just what lots proposed line would cut.

A.

The Rail Head in Some of its Aspects.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Allow me to take exception to the implication you find in my letter in regard to rail wear that the wheels of an up grade train are drawn over *against* the inner rail. You state my position correctly in quoting me as saying that the wheels are drawn *towards* the rail. As my whole contention was that the wheels do not rub materially against either rail while a train is being drawn up hill, and as I stated at some length my reasons for believing that the wheels rubbed the inner rail little, if any, I cannot understand your view of my letter. My own observation coincides perfectly with the view that the wheels rarely rub the inner rail, and my object was to show that they rubbed against neither very much. I should, therefore, like to know your reasons for believing that there is any considerable flange friction against the outer rail when the engine is pulling. My position is that ordinarily only the leading wheels of an engine crowd the outer rail on up grade curves, except when the curve is sharp enough to force the

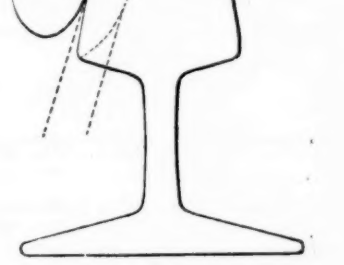


Fig. 1.

rear drivers over to the outer rail through fulcrum action of the forward drivers bearing against the inner rail, or in cases where the elevation of the outer rail is insufficient to balance the centrifugal force of the train.

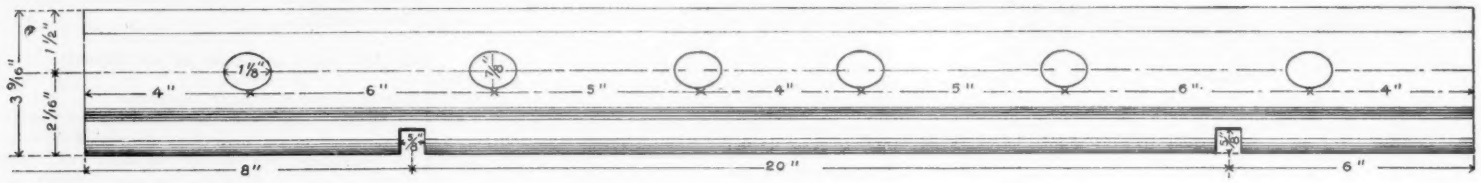
As to my remark about the increase of the side angle, I can only say that all of the larger roads use as much as 5 degrees side angle now in place of a vertical side. The Pennsylvania 76 has 6 degrees, and the Boston & Lowell 72 has 7 degrees, and the Lehigh Valley section, the Delaware, Lackawanna & Western section of 1887, and Mr. Mattes' carefully designed 88 lb., which may be considered as the latest studies in this direction, show 10 degrees, which I think establish a "tendency." I did not claim that the increase was made with a view to flange wear, for it was undoubtedly made, as you state, to increase the bearing on the splice; but I argued that there is no objection to it on the score of loss of power.

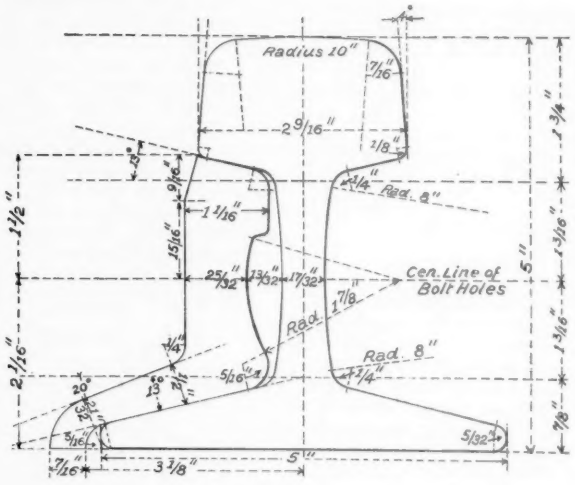
As to the increased liability to climbing, I hope the inclosed section of the Lehigh Valley rail, fig. 1, borrowed from your own cut, will show that until the angle is greater than that of the tangent to the flange curves at the reversing point, there will be no increased climbing tendency from this cause. In this section it is obvious that the side angle has no effect at all as to climbing, since the flange ceases to touch the rail side before it reaches the straight part; nor will it touch this straight part until, as I said above, the rail side has, at least, as much angle with the vertical as the tangent to the flange curves at the reversing point. This angle, either with the coal car flange shown or with the deeper flanges indicated by the rail wear, would allow of considerably more flare to the side than at present, with still further advantage to the splice bearing and increased value to the top flange of the angle bar considered as a girder.

Coming now to flange wear, it is obvious for the reasons just

Fig. 2.

detailed that the increase of side angle will have no effect in increasing flange friction until the side of the head begins to wear away; and when that wear begins, the greater surface to be worn away will at least balance the increased activity of wear from the outer part of the flange, since the side pressure of the wheel will be distributed over a larger surface, and the wear from the upper part of the flange will not be *greater* than with a less flaring rail-head. Hence there will be less rapid wearing of the rail-head and more uniformly distributed and less injurious wear in the flange. On heavy coal roads I understand that the head of the inner





STANDARD 85-LB. RAIL AND ANGLE-SPLICE—PENNSYLVANIA RAILROAD.

rail on curues is sometimes worn away by the action of the flanges, in the same way as the outer rail in the Lehigh Valley specimen above referred to, but I have never come across such a case in my own experience.

I have recently had occasion to observe the condition of some Dowlais steel of 1869, which was probably laid down about that time on a 5 degree curve on the then Morris & Essex. This is on an up-grade double track section about a quarter of a mile after leaving the station. The section appears to have been about the same as the worn section of 1871 steel, of which I inclose a tracing, fig. 2.

The outer rail is nowhere more than one-sixteenth of an inch less in extreme width below the burr than the inner one, and in general there is no difference in width. It is to be remembered furthermore that the inner rail may be a little spread even in the main body of the rail. The upper edge is naturally well worn and polished, but the fact that it has not undergone in 19 years more side wear than above indicated under a traffic amounting at present to about 50 train a day—46 being passenger—seems to me a strong indication that the side pressure of the flanges cannot have been very great.

The objection that seems to me most valid to the flare of the head downwards is the unfavorable distribution of the material for strength by putting it nearer the neutral axis. To avoid this I should make the head as shallow and wide as practicable, and keep the upper corner at at least as sharp as the throat of the wheel flange. This latter, both on account of the value of the metal for strength at this point, and to avoid increasing the radius of flange rubbing more than necessary before the rail becomes worn.

Reviewing the whole situation, it appears that in a few cases on coal road curves the inner rail has been worn excessively on the side by the sagging of the cars to that side of the track, and in other cases on limited portions of a good many roads the outer rail has been heavily worn by the crowding of the flanges on down-grade curves. With these exceptions, side wear has rarely extended below the corner curve of the rail.

In the first class of cases some loss of motive power would ensue *after* the rail has become worn below the corner curve. In the latter class, no loss of motive power will arise at any period, and only a very limited increase of rail grinding *after* the rail becomes worn.

The question then is whether either of these contingencies is worth considering in determining the shape of the rail-head.

The more general question of the depth of head required I will not go into, but I believe it may be made much less than it is on most roads and the fishing angle flatter, the material saved being added to the width of the head, with advantage not only to the strength of the rail regarded as a girder, but also to the strength of the fish bar, which could be made deeper and wider in the head; and with saving in the wear of rail-heads and wheel treads.

I inclose a section of the Denver & Rio Grande 40-lb. rail, fig. 3, which has done excellent service on that road. It presents a broad head and base for its weight, with the metal well concentrated away from the neutral axis, and a good opportunity for efficient splicing. In spite of the sharp upper corner to the head, it does not seem to be much of a flange cutter.

The new splice for the New York Central, which you illustrate in your last, is a very singular departure. Your readers will probably like to hear from Mr. Katté the reasons he has for tying the rail down to the middle tie. Has he found so many breakages in the upper part of the splice at that point that he considers it necessary to guard against this action by weakening the lower flange of the splice at the point where it most needs strength? It is very possible indeed that these breakages occur from the upward reaction of the rail ends after being depressed over the middle tie, but is it not rather a common remedy for this to aggregate the reaction by increasing the depression?

I will not deny that the reaction *may* be made less

Fig. 3.

injurious to the splice by removing the fulcrum which the bottom flange of the splice now offers for the breaking effect on the top flange, but if so, what becomes of the advantage of the three-tie arrangement? If the middle tie is so prone to yield, why does not the three-tie splice become simply a suspended joint with much greater distance between bearings, and, in the case of the new splice arrangdment, which you illustrate, with a weaker splice?

I have wandered a good deal from the thesis of my original letter to you and I will close with a restatement of what that thesis was, viz., to show that the side wear of rails seldom indicated any serious loss of motive power.

W. HOWARD WHITE.

Standard Rail and Joint—Pennsylvania Railroad.

We show in this issue the 85-pound rail, and the splice used with it, which the Pennsylvania is putting down on the main line between New York and Pittsburgh. We made some comment on this section as compared with the 80-pound section of the New York Central in our last week's issue, and there is no occasion to say more now. Mr. Brown, the Chief Engineer, calls particular attention to the fact that this rail is five inches high, and says that for some years he has been convinced that the rail used was too low, and has striven to add to its height.

Formula for the Supporting Power of Piles.

BY IRA O. BAKER, PROFESSOR OF CIVIL ENGINEERING, UNIVERSITY OF ILLINOIS.

In the *Railroad Gazette* for July 8, 1887, page 453, there was republished an article on the above subject by the writer of this, and also some comments thereon by Mr. John C. Trautwine, Jr. In explanation of the long delay in making this reply, the writer would say that since writing the former paper the subject has been entirely out of his mind until taken up again recently in connection with class-room work.

The statement in the former article that "if a light ram with a long fall be used on a long, heavy pile, the penetration may be nearly or quite zero, and the bearing power will appear to be nearly infinite, while in fact it would probably be but a few times greater than the weight of the ram," was intended to apply to Nystrom's, Sanders' and Mason's formulas, but not to Trautwine's; the latter is unexceptional in this respect.

In what follows the writer has not the slightest intention to disparage the Trautwine formula. It required great skill to discover an empirical formula which would give results agreeing so closely with the only experiments available by which to test it. It is undoubtedly far the best formula now in common use. The writer hopes to show that another formula applied in a different manner will probably give still better results.

One of the defects of the Trautwine formula is that since it contains no term expressing the material of the pile and condition of the head, the formula is strictly applicable, even to piles driven in soft mud, only when the head is battered about the same as the pile from which the formula was derived. In proof that this is not an imaginary nor unimportant objection, it is only necessary to call attention to two experiments* in which the weight of ram, height of fall and penetration were identical, and yet the load supported by one was 2½ times that supported by the other. This shows that there is another important variable, *i. e.*, the condition of the head of the pile, which should find expression in the formula. The defect in the formula owing to the omission of the term involving the condition of the head can also be illustrated by comparing two other experiments,† in which the supporting power, the weight of the ram and the penetration was practically the same, and yet the above formula gives the supporting power of one twice that of the other. Another defect is that the constant is adjusted for comparatively easy driving, and hence is inapplicable either for very easy driving or for hard driving. For example, in very easy driving the formula $P = \frac{W h}{d}$ must be nearly right; but under this condition it gives results from 3 to 5 times as large as those by Trautwine's formula.

The experiments quoted in Mr. Trautwine's article do not fulfill the conditions necessary for a proper determination of g in the writer's formula. Besides they are very inconsistent within themselves, as was explained above. It is known that in some of the cases the pile head was considerably broomed, and it is probable that they were in all. By the light of the table on page 452 of the *Railroad Gazette* for July 8, 1887, we know that if the test blow had been struck on sound wood, the penetration would have been considerably increased; a small and apparently reasonable increase in the several penetrations as given by the experiments (see Mr. Trautwine's article) is sufficient to make the supporting power computed by equation (6) agree with that observed. However, the data of the experiments, as they stand in Mr. Trautwine's table, substituted in equation (7), give values of g from 1.5 to 337, with an average of 130. The range of these results shows the inconsistency of the experiments and the smallness of the average shows that the last blow was not struck on sound wood. This value of g is of little or no practical value.

The following item, which is a striking confirmation of the reliability of the forms of the equation $P = \sqrt{2q\,Wh + (qd)^2} - q\,d$, was discovered after the former article was written. A. C. Hertiz deduced‡ an empirical formula for the supporting power of piles, from the records of the driving of over 400 piles, of which nearly 400 were afterward pulled up; the observed power required to withdraw the piles was plotted, and then a line drawn which would represent these values. The equation of this line was given under the form $y = \frac{x}{P} = \frac{P}{500}$, in which $y = d$, $x = Wh$, and $P =$ the supporting power. Solving this:

$$P = \sqrt{500\,Wh + (250\,d)^2} - 250\,d.$$

This equation is exactly of the form of the preceding formula for the supporting power, although deduced in an entirely different way. The value (250) of the constant in the latter differs from the value of q deduced in the paragraph next above, which shows that the average brooming of the pile heads was less in the English experiments than in the the other case.

The following example illustrates the importance of having a correct formula for bearing power of piles, and also the necessity of taking into account the battering of the head of the pile. "The South Street Bridge approach, Philadelphia, fell by the sinking of the foundation piles, under a load of 24 tons each. They were driven to absolute stoppage by a 1-ton hammer falling 32 ft. Their length was from 24 to 41 ft. The soil was hard gravel, overlaid mud, which last becomes tough clay before touching the gravel."‡

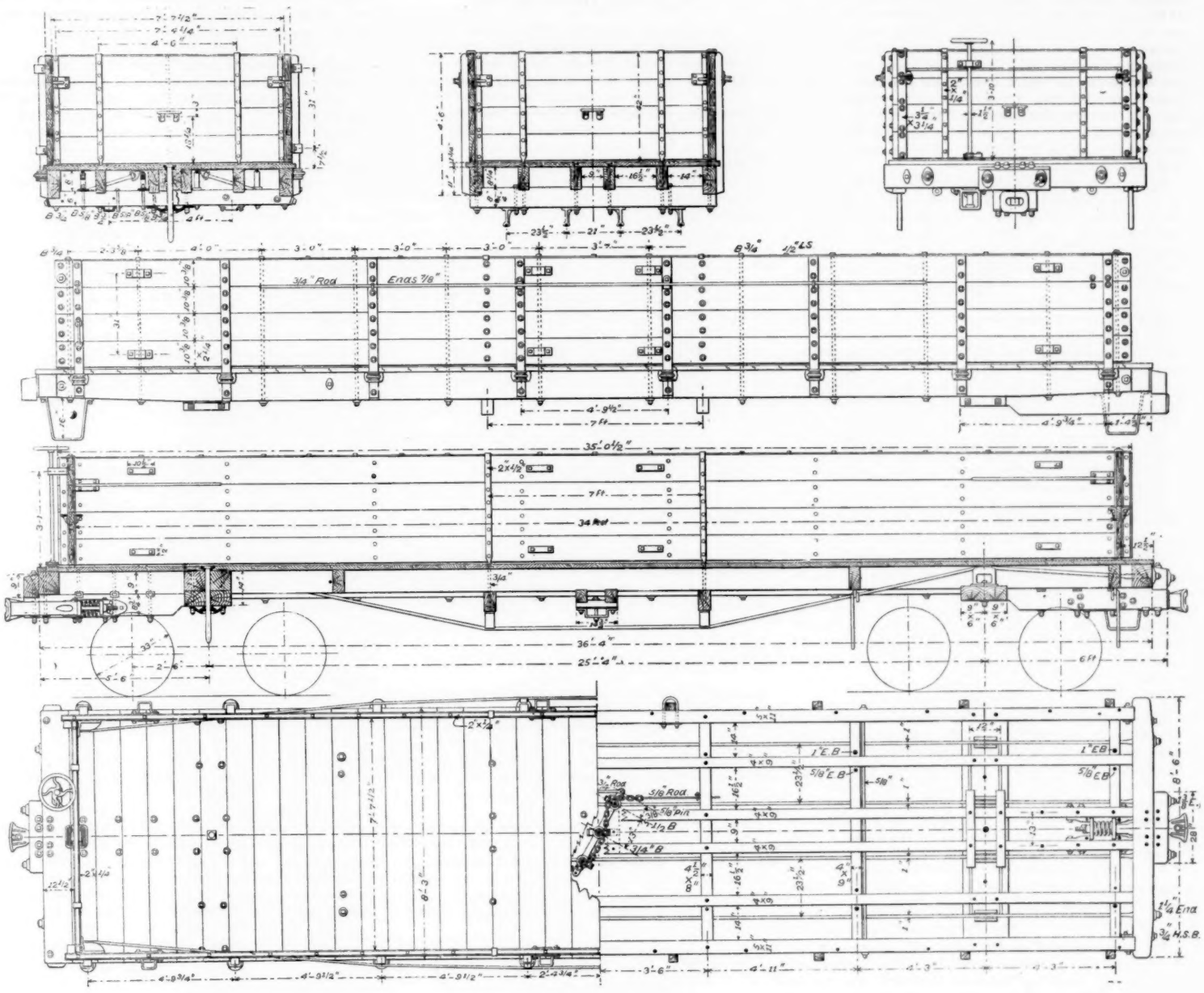
The only explanation of the failure that the author has seen is that the "vibration of the piles, caused by the moving loads, allowed the water to work its way down the sides of the piles, and thus decrease the bearing power."§ The writer does not recall the details of the construction of the approach, but this explanation seems hardly sufficient. It is more probable that the supporting power was under-estimated, or, in other words, that the factor of safety was unduly small. The small penetration was assumed to indicate great

*Experiments No. 3 and 4 of the table on p. 453, *Railroad Gazette* for July 8, 1887.

†Experiments No. 4 and 5 of the table on p. 453, *Railroad Gazette* for July 8, 1887.

‡ *Proc. Inst. of Civil Engineers*, Vol. LXIV., p. 311-15; republished in *Van Nostrand's Magazine*, Vol. XXV., p. 373-6.

§ Trans. Am. Soc. of C. E., Vol. VII., p. 264, *et seq.* The quotation is from memory, assisted by a brief note made at an unknown time in the past.



STANDARD 50,000-LB. GONDOLA CAR, NEWPORT NEWS & MISSISSIPPI VALLEY CO.

Designed by MR. T. L. CHAPMAN, *Supt. Motive Power.*

supporting power, while it was probably only a result of the brooming of the pile.

If in the equation $P = \sqrt{2\,q\,W\,h + (q\,d)^2} - q\,d$ we make $W = 1$, $h = 32$, $q = 5{,}000$ * and $d = 0$, as in the above example, then $P = 565$; but this is not the supporting power of the piles since the last blow was not struck on sound wood. If $d = 0.1$ ft., the above formula will give $P = 255$; if $d = 0.2$ ft., $P = 150$; if $d = 0.3$, $P = 100$; if $d = 0.4$, $P = 76$; if $d = 0.5$, $P = 63$ and if $d = 1.1$, $P = 24$. It can never be known what the penetration would have been had the last blow been struck on perfectly sound wood, but in the light of the conclusions drawn from the table of penetrations as given on page 452 of the *Gazette* for July 8, 1887, it is certain that the penetration would have been considerably more than zero. The difference in penetration between a blow upon the bruised head and one upon sound wood would be considerably greater proportionally than as in the table on page 452, since in this case the hammer was less than three-quarters as heavy while the fall was 10 to 15 times as great.

The conditions for the piles under the Philadelphia bridge are somewhat similar to those from which Trautwine's formula was derived; hence, *if* the average condition of the head was the same in both cases, Trautwine's formula would give a fair result for the supporting power of these piles. By this formula the supporting power should be 160 tons. It does not seem possible for the piles to have failed under 24 tons, if the supporting power was 160 tons at the time of driving.

Standard 50,000-lb. Gondola Car—Newport News & Mississippi Valley.

The accompanying illustrations represent the standard 50,000 lbs. gondola used on the Newport News & Mississippi Valley, the eastern section of which is, perhaps, better known as the Chesapeake & Ohio.

The car, as will be seen, is of very stout and substantial construction, and is carefully designed. The engravings show clearly the general arrangement and details of the car, and the principal dimensions and particulars of the weight, etc., of material are given below:

Specifications and Material for Standard 25-ton Gondola Car.

BODY.

General Dimensions.

Capacity	25 tons.
Length of framing over sills	36 ft. 4 in.
Width of framing over sills	8 " 0 "
Length from out to out over drawheads	38 " 7 "
Width from out to out over all	8 " 11¼ "
Centre of drawhead above rails	2 " 10 "
Length of box in the clear	34 " 0 "
Width of box in the clear	7 " 7½ "
Height of box above floor	3 " 6 "

Condensed Bill of Material.

Yellow pine sills, stringers and framing	1,851 ft.
White oak	1,278 "
Castings	1,299 lbs.
Wrought-iron forgings	1,094 "
Standard malleable drawheads	172 "
Truss rods (6)	510 "
Bolts (523)	701 "
Nuts (648)	156 "
Cut washers (248)	10 "
Nails (20 D steel)	29 "
Chain	20 "
Mineral paint mixed	50 "
White lead	5 "
Asphaltum	4 "
Buffer springs, 2 (6 in. × 8 in.), 2 coil	65 "
Weight of car body	13,254 "

TWO 25-TON RIGID TRUCKS.

General Dimensions.

Capacity	25 tons.
Wheel base	5 ft. 0 in.
Gauge of track	4 ft. 9 in.
Axles (journals)	4 in. × 7 in.
Limit between flanges	4 ft. 5⅛ in. to 4 ft. 5½ in.
Width between centers of arch bars	6 ft. 3 in.
Brakes on 8 wheels hung from body of car	

Condensed Bill of Material.

Forgings (30)	872 lbs.
Axles (4)	1,484 "
Castings (108)	1,429 "
Wheels (8)	4,800 "
Bearings (8)	80 "
Lumber	315 ft.
Bolts (98)	233 lbs.
Nuts (150)	67 "
Springs	as specified.
Mineral paint	5 "
White lead	1 "
Varnish	1 "
Asphaltum	5 "
Weight of trucks	10,396 lbs.
Total weight of car	23,650 lbs.

* This value of q differs a little from the one used in the orginal article; but it probably agrees more nearly with practice, and, besides, it makes the formula more simple.

Some State Reports.

ALABAMA.

The seventh annual report of the Railroad Commissioners of Alabama for the year ending June 30, 1887, is received. The Commissioners give the following statistics of mileage and results of operation:

	1887.	1886.	Increase.	P. c.
Miles of roads	2,256	2,076	180	8.7
Gross earnings	$8,776,579	$7,428,656	$1,347,924	18.2
Operating expenses	6,128,243	5,647,140	511,102	9.0
Net earnings	2,648,648	1,888,560	760,088	40.3

While the new road reported for the official year is 180 miles, the number of miles built and equipped from June 30 to the date of the report, which is Oct. 30, was 284, and at that latter date 367 miles was under contract for construction. In the official year the track laid with steel rails was increased by 252 miles. The Commissioners point out that the increase in tonnage over the main lines renders it necessary to put down heavier steel rails, and to rebuild and strengthen bridges as rapidly as possible, and the expenditures for these purposes during the year have considerably increased the operating expenses. It is stated that the heavy traffic has occasioned the construction of many miles of new side-track, but that while these additional sidings give present relief they are not deemed sufficient for the demands of the immediate future, and the Commissioners consider that double tracks will before long be indispensable.

There were 41 new charters procured for railroads from June 30, 1886, to October, 1887.

Regarding railroad legislation, the Commissioners recommend nothing further. During the last session of the Legislature two important acts were passed, which required the aid of the Railroad Commissioners to put them in force. The first was an act to provide for the comfort, convenience and accommodation of passengers at stations. By this act it was specified that the companies should provide sufficient rooms in passenger stations, having refereuce to sex and race, and that these rooms should be properly heated and lighted. Also, that there should be a conspicuous bulletin board showing the schedule time of arrival and departure of passenger trains, and indicating whether or not those trains are on time, and if behind, how much. The second act referred to re-

quires all railroads in the state carrying passengers to stop at telegraph stations nearest or most accessible to the county seat of each county through which the road passes. Under this act the Commissioners designated, for each county in the state, such stations as were provided for by the act. We are not informed by the report how far the provisions of these acts are complied with, or whether or not the Commissioners have had any difficulty in securing their enforcement. To one at this distance such legislation seems trivial and unnecessary, but it is possible that the conditions prevailing in Alabama required it.

No report is made of the number of complaints received by the Commissioners, or of their adjustment, further than the remark that, "in most cases, we reach an adjustment and settlement of the issues between the parties either by correspondence or by personal conferences." The complaints in the main relate to freight charges, discriminations, depot improvements and transportation demands.

In inspections made during the year the Commissioners have found the railroads generally in a fair condition of repair "considering the increased tonnage being hauled over them." In some sections of the state the roads suffered immense damage by destructive rains and overflows in the Spring of the year, which entailed very heavy expenditure for repairs. In the Tensas Swamp, on the Mobile & Montgomery, for instance, the track was submerged for many miles and much of it washed entirely away. The grade for a distance of 12 miles has been raised during the year about 2½ ft., and is now believed to be above high-water mark.

The Commissioners have decided that the time has arrived when passenger depot accommodations should be provided, suited to the importance and necessities of the city of Montgomery, and will in the near future commence action toward the erection of the needed buildings.

Regarding the various safety appliances the Commissioners make no recommendations other than to say that some method of heating trains, other than by stoves, should be adopted, and that the retention of fires in the stoves on passenger coaches ought to be prohibited by statute, and the Commissioners will make recommendation to that effect to the legislature.

MISSOURI.

The twelfth annual report of the Railroad Commissioners of Missouri for the year 1886 is just received. The great delay in publishing it has arisen by reason of the accumulation of work at the public printing office. It is expected that the report for the year 1887 will be out by June 15. The report now issued is of interest to the student rather than as a matter of current news, and, therefore, we reproduce none of the statistics. Appendix E gives the railroad legislation of the state from 1881 to, and including, the general "Act to Regulate Railroad Corporations," passed at the extra session, and approved last July, of which an abstract has already appeared in these columns.

MAINE.

The annual report of the Railroad Commissioners of Maine for the year 1887 is received. The Commissioners state that the reports of the several companies in the state show a most gratifying increase, both in passenger and freight earnings, notwithstanding the fact that in the early part of the season many railroads on the seaboard were seriously affected by some of the provisions of the Inter-state Commerce law. No comparative statistics are published in this report, nor are the reports of results of operation of the different railroads of the state collected here as is usual in the reports of state boards. Doubtless the Maine Commission is very much hampered in its work by the want of money for the payment of clerical labor and of office facilities. Indeed, almost the only thing that the Commission has to say with regard to further legislation is a presentation of the facts in regard to the very small compensation now received by the Commissioners and the entire want of facilities for carrying on their work. The compensation is now fixed at $5 a day, to be paid, according to the language of the statute, "by the railroads on which their services are rendered." But in many instances these services can neither be charged to railroads nor railroad corporations, but to petitioners, whether corporations or individuals, and the Commission considers it reasonable that the state should assume the burden of paying the board for discharging the duties which by law are required of it, and that the salary should be such as will enable the members of the board to devote their whole time to the work.

Many charters were granted at the last session of the legislature for railroad corporations, but only three were organized under the general railroad law of 1876. One of these, a line of 15 miles, was approved by the board; another one has made no survey, but its articles of association were approved by the board. The third is the Boston & Quebec Air Line. This company was organized for the purpose of building a line from Skowegan, up the Kennebec Valley to an intersection with the Canadian Pacific line, known as the International. The total length of the projected line is about 80 miles, and the company asked the approval of the board for the portion from Skowhegan to Solon, about 15 miles. The board declined to approve, on the technical ground that while the law would require the approval of the whole line, the petitioners ask for the approval of but a part of it. The building of the whole line might be a public convenience sufficient to counterbalance any injury to private interests, while the building of a part only of the line might work injury to existing private interests without any compensating public gain. The case is interesting, as an example of an effort to protect the rights of all concerned by state regulation of railroad building, of which we have but few illustrations.

The Susemihl Freight Car Door.

The accompanying illustration shows a form of car door recently patented by Mr. F. G. Susemihl, Mechanical Engineer of the Michigan Central, Detroit. The means by which the door is closed appears to resemble closely those in general use, but it is claimed that an improvement is effected by offsetting the guide rails; one-half of the rails being in a different plane from the other, and both halves have a bevel of about 1 in 4 opposite or nearly so to the doorposts. Both top and bottom rails have the same form, and in closing the door, the four shoes the bevels strike simultaneously and draw the door automatically with a parallel ruler movement against the doorposts. The channel in the shoes is so large as to give the door four times the ordinary play on the rail, and the rails are placed so much farther from the side of the car than usual that the door has three to four times more play than with the ordinary arrangement. This could not be done with a straight rail running parallel with the side of the car, as either the door would scrape or it would be too far from the side of the car when closed.

It is claimed, however, that with the arrangement illustrated the door has all the necessary play, and at the same time it is brought snug against the face of door-posts while closing. These features prevent the door binding when being moved and insure its closing tightly.

It is also claimed that the door is also not liable to be jammed by the friction of the load in the car, which may shift and bear hard against it during the journey. Directly the door is moved to open it, it moves away from the load and in 4 in. travel moves 1 in. outward.

It is further claimed that this door when closed lies snug against the door-post and is spark and storm proof.

The Michigan Central have purchased the right to use the door on their road and several lines have ordered shoe castings in order to try this method of operating car doors.

Any further particulars may be obtained of the inventor or of the Michigan Malleable Iron Works, Detroit.

The Relations of Railroads to their Employes.

Professor A. T. Hadley last week delivered an address before the Commonwealth Club of New York City, on The Rights and Responsibilities of Railroads. It dealt almost exclusively with questions growing out of the present labor troubles. Professor Hadley's profound study of railroad problems, and his experience as Labor Commissioner of his state, give his views exceptional weight. His leading points were as follows:

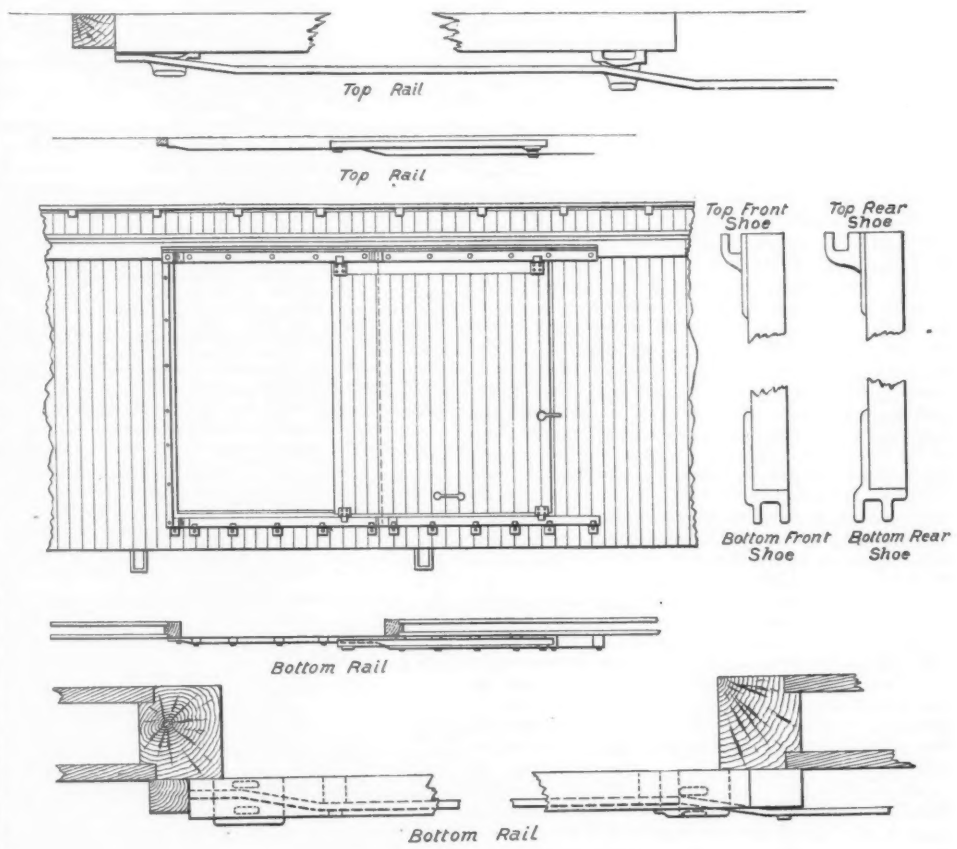
A railroad company must perform the work for which it is chartered, without serious interruption. This is an industrial necessity. If the existing law and the present administrative methods do not provide for it they must be changed. In any event, the public must have the service. But the workmen cannot be allowed to take advantage of this necessity, and dictate to the railroad companies the way in which their railroad business shall be carried on. This would check the railroad development of the country even more completely than did the worst excesses of Granger legislation No one would be willing to risk his capital under such a system It would interfere with discipline which is necessary for efficiency and public safety. It would put the power in one set of hands and the responsibility in another; the worst mistake which can be made in a matter of this kind.

The practical question is this: How can we enforce the responsibility for continuous service upon the railroads without placing them at the mercy of their employés? The difficulty cannot be met by simple remedies. Combination and conspiracy laws will not do it. They may narrow the fighting ground, or secure fair warning to the public; but if the men think they have a real grievance it cannot be suppressed in this way. The public mind will hardly tolerate such suppression, and in any event the attempt to enforce it costs more than it is worth. Nor will arbitration meet the difficulty. It is often useful in early stages as a means of preventing trouble. There are unfortunately many managers who pursue a policy which causes misunderstandings for which there is no real ground. In these cases the chance to talk matters over calmly is sometimes all that is needed. But after a fight has begun, an award of arbitrators is apt to be worse than useless, because there is no effective means of enforcing it. Some of the worst labor troubles have arisen on the basis of past awards of arbitrators, where the parties quarreled as to the interpretation of the decision, and had no means of settling the matter authoritatively without a strike.

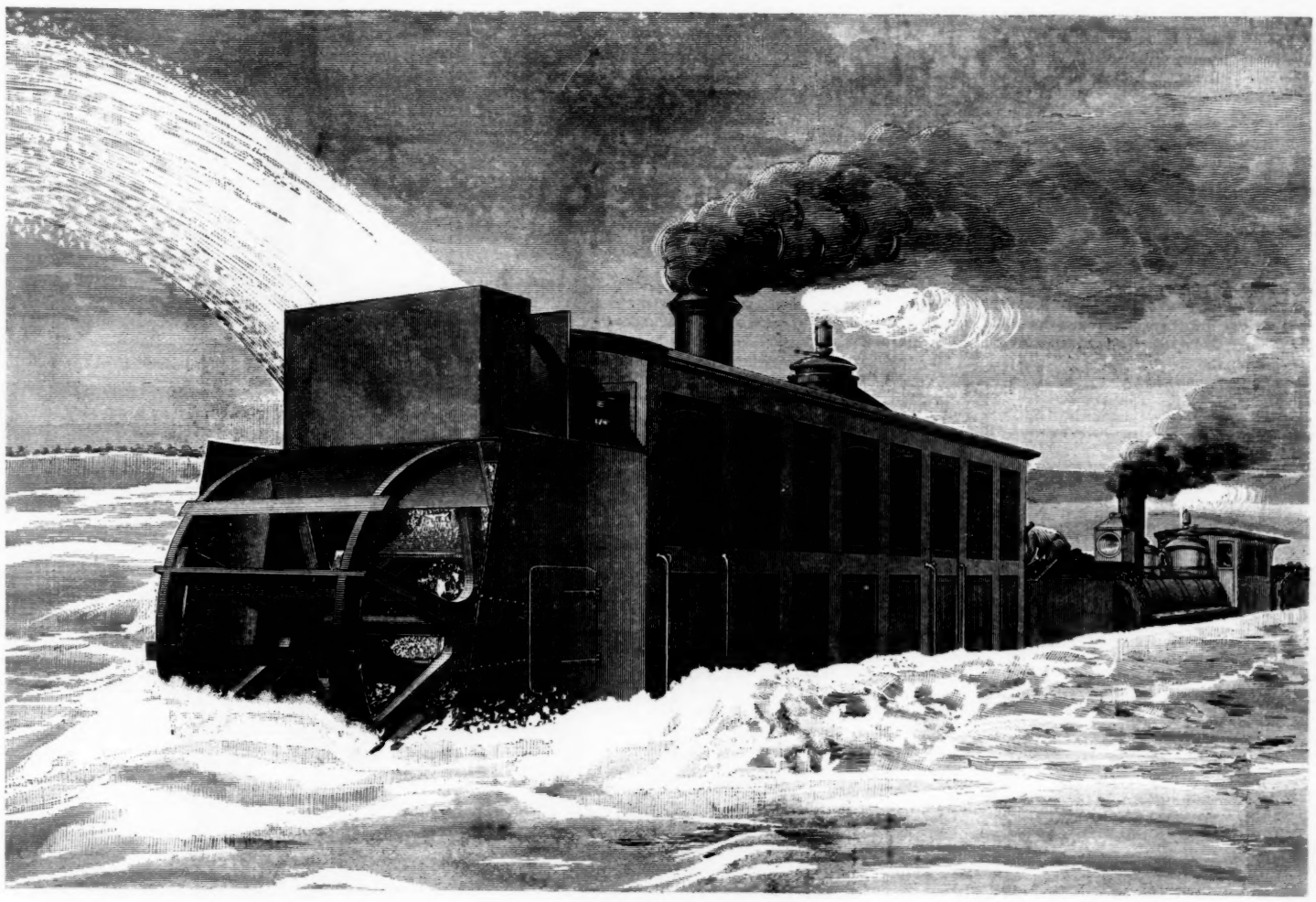
If no such simple cure is possible, we can only meet the evil by a policy of prevention. This will be by no means easy; but it is the only thing left to do. In old times the employé came in personal contact with his employers. To-day he does not. How can we create an *esprit de corps* among large bodies of workmen and officials of various grades which shall replace the old bond of personal interest and sympathy? This is in some respects the great railroad problem of the immediate future. The attempts to meet it thus far have been of little account. Relief associations such as were organized after the strikes of 1877 are interesting rather because they show that managers recognize that there is such a problem confronting them than for any great results which they have accomplished. Workmen are apt to distrust any scheme which seems to place money of theirs on deposit with the corporation authorities. It looks like giving hostages for good behavior. Even when there is no reason for any such suspicion, it is not surprising that it exists.

Nor is much to be expected from any elaborate system of profit-sharing or co-operation. Such schemes are too complicated to be understood. The relation between work and extra profits is too obscure. Rewards for good work must be sought rather in fixity of position and certainty of promotion. In theory, every railroad adopts such a system. In practice it is often very imperfectly carried out. Men are dismissed without any full and open statement of the grounds for such action. In the great majority of instances there is probably good reason for the dismissal; but the fact that the company often gives no explicit reason creates a feeling of insecurity which does infinite harm.

It is impossible to give detailed directions as to the way in which such a reform can be carried out. Personal elements enter largely into the question. One superintendent has the power to enlist the loyal feelings of his men in the service of



THE SUSEMIHL FREIGHT CAR DOOR.



THE RAILROAD SNOW EXCAVATOR.

the company. Another, with equal technical skill, has not. In the business organization of the present day there is a tendency to give too much prominence to mere business qualifications in the narrower sense, and too little to the power of personal influence. We have adopted a system of natural selection which has caused our companies to be controlled, in the last resort, by leaders of dollars rather than leaders of men. It may be that these strikes under which we now suffer will be the beginning of a healthful reaction in this respect.

Some such means of prevention must be developed by our railroad managers, and will be if they are truly fitted for their present position of leadership. If they do not do something of the kind, we are face to face with the alternative of state ownership. There is no good reason for believing that state-owned railroads would be managed with anything like the efficiency or economy which we enjoy at present, nor is it at all sure that they would be free from interruptions of traffic. But their advocates claim that they would, and if the leaders under the present system confess their inability to meet this difficulty, it gives an overwhelming argument to those who desire a change. A large part, perhaps a majority, of the people of the United States believe that state ownership of railroads would be a good thing. However much they may be mistaken, this belief is a political fact which we must take into account. If our railroad managers confess themselves unable to prevent strikes, they will find themselves overwhelmed by a demand that the control of the transportation system shall be placed in other hands than those which control it at present.

The Railroad Snow Excavator.

The device for clearing railroad tracks of snow which is illustrated herewith has lately been patented by Mr. George Cox, in the United States and Canada, and it is the intention of the owners of the patents to immediately begin the construction of machines and to fill orders for next winter.

The essential feature of the machine is a revolving fan wheel, about 9 ft. in diameter, mounted on a horizontal shaft. The fan wheel carries longitudinal knives and vanes—the knives to cut the snow and ice, and the vanes to carry it back into a chamber, from which it is thrown out by the centrifugal force and the air current established. The fan wheel, which will make from 200 to 250 revolutions per minute, is actuated by two engines, placed with a boiler on the car and connected to cranks on the ends of the shaft. The case inclosing the after portion of the fan wheel fits close to the ends of the vanes, and communicates directly with the spout above, through which the snow is discharged. The snow is thus retained in contact with the vanes until it is discharged vertically through the spout. The spout is provided with two curved deflecting plates, which direct the stream of mingled snow and air toward one side of the car. These plates are so arranged that they may be slipped backwards out of the spout, and the same operation draws in another set of plates, curved in the opposite direction, which deflect the current to the opposite side, thus changing the delivery of the snow from one side of the track to the other at will. This change can be effected while the machine is in motion, and without bringing the car to a standstill or lessening its speed. An ice breaker and flanger is also placed in front of the first pair of wheels of the car carrying the apparatus. The whole is pushed forward as is the Rotary by one or more locomotives behind it, and the car is provided with a steam brake.

The designers claim as special points of superiority in this new excavator, first, the direct connection of the engines, which dispenses with the use of bevel gear wheels; second, that the fan wheel does not overhang its bearings, third, that the direction in which the snow is delivered can be changed with great facility, and without stopping the car or reversing the engines of the machine; fourth, that the knives are secured *rigidly* to the wheel, which gives this machine great advantages in strength and simplicity of construction. There are also other advantages claimed which it is not necessary to specify here.

The substance of the case claimed for it is that in avoiding bevel gear wheels, overhanging screw and movabl knives, and in the less power required to push it, it presents a more effective and durable means for removing the snow than any machine heretofore known. Also, that not only in its operation is it economical, but that the great simplicity in its constituent parts will enable it to be cheaply built.

The ownership in the device is now represented by George Cox and William O. Barnes, of Paterson, N. J., as trustees, who invite correspondence from railroad companies interested.

Moving the Brighton Beach Hotel.

The task of moving a great Coney Island hotel 500 ft. is so singular and unprecedented that it has excited much interest, and though the difficulties of such an undertaking may appear insuperable, the means employed are very simple, and ultimate success is practically assured. Many eminent engineers foretold failure, and those responsible for the plan of operations adopted are therefore to be congratulated on having the courage of their opinions and the skill to justify their judgment.

The Brighton Beach Hotel, which has just been hauled part of its inland journey of 500 ft., is a wooden structure of irregular form resting on brick walls rising about 5 ft. above the ground level. The extreme length of the building is 460 ft., the extreme width 200 ft., and the minimum width is about 150 ft. Part of the structure has five stories and the estimated total weight that had to be moved is given as 5,000 tons, though some authorities place the weight at only 4,000 tons.

It is hardly necessary to state that this hotel is one of the three great hotels at Coney Island, and is about 9½ miles from the City Hall of New York by the most direct route. While the two great structures further east have been efficiently protected by piling and riprap from the encroachment of the sea, the sandy shore on which the Brighton Beach Hotel stands has been washed away, and the high-water line has advanced about 550 ft. in the last five years. The waves had gradually undermined the hotel and last week were washing among the piling on which the centre and seaward portion of the hotel rested.

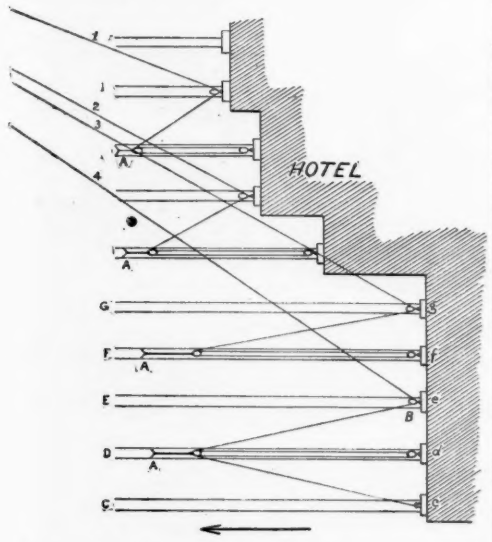
It was evident that the three usual courses were open. Either the encroachments of the sea might be prevented by efficient sea walls, or (2) the hotel might be taken down and rebuilt further inland; or (3) the hotel might be moved bodily. The latter course was finally determined on, we believe, at the suggestion of Mr. J. F. Morrow, the Superintendent of the Brooklyn, Flatbush & Coney Island Railway. The distance to be traversed, 500 ft., and the weight and size of the hotel, rendered the ordinary methods of using jacks, etc. inadvisable, but it was deemed feasible to place the weight of the hotel on a large number of strong freight cars placed on parallel tracks and haul them by several locomotives.

Twenty tracks were laid under the hotel, and were supported partly on piling and partly on a series of sawn balks and ties laid on the natural surface of the ground. These tracks were carefully leveled by means of shims, and holes being cut in the brick walls supporting the hotel, iron gondola cars were placed underneath the hotel. Six cars were placed on each track where the hotel was widest, and four cars were placed under some of the wings where the hotel was only 150 ft. wide. The cars were of peculiar construction, the sills being composed of wrought iron tubes, with cast distance-pieces, truss rods, clips, etc., all bolted together and disposed in a somewhat singular and ingenious fashion. The end sills, especially, attracted attention, being apparently chiefly composed of thin steel castings of box section freely lightened by perforations of ornamental pattern and design. Many of our readers will recollect that a car on a very similar principle was exhibited at the Exposition of Railroad Appliances held at Chicago in May and June, 1883.

The 112 cars used in this case had a nominal capacity of 50,000 lbs. each, but probably sustained an average weight of fully 80,000 lbs. each. Timbers about 12 in. square were placed across these cars, resting in most cases on the sides and not on the floors of the cars. The weight of the hotel was gradually transferred to these timbers by means of shims, wedges and packing pieces, and to some extent the timbers were connected and braced together so as to dis-

tribute the various strains and cause the hotel and cars to move as one structure.

The twenty tracks being leveled, and the load as far as could be judged equally distributed on the 112 cars used; the next step was to divide the hauling power of the locomotives so that the pull on each set of cars would be tolerably equal. This was accomplished by an arrangement of blocks and tackle shown in the accompanying sketch of the northwestern corner of the hotel. Ten tracks are shown in the engraving, half the total number used. *C*, *D*, *E*, *F*, *G*, etc., are the extreme western parallel tracks, and *c*, *d*, *e*, *f*, *g*, etc., are the ends of the cars supporting the hotel. The falls 1, 2, 3, etc., lead to the locomotives on two of the centre tracks. Treble blocks were attached by a chain sling to the tracks at *A*, *A*, *A*. A double line of heavy balks laid behind the blocks braced the different tracks together, and prevented any tendency of the road to rise. Corresponding blocks being attached to the drawbars of the cars, the falls were led off, passing through single snatch blocks attached to some of the cars as shown in the sketch.



It was estimated that the locomotives would move 6 ft. to move the hotel 1 ft. About three tons or nearly two miles of new 1½ in. manilla rope were employed.

Six ordinary American type passenger engines were employed, three locomotives on each track. The falls radiated to the locomotives, and as some of the falls from the western portion of the building led to the locomotives standing on the eastern track and vice-versa, the resultant pull on the locomotives was practically parallel with the track.

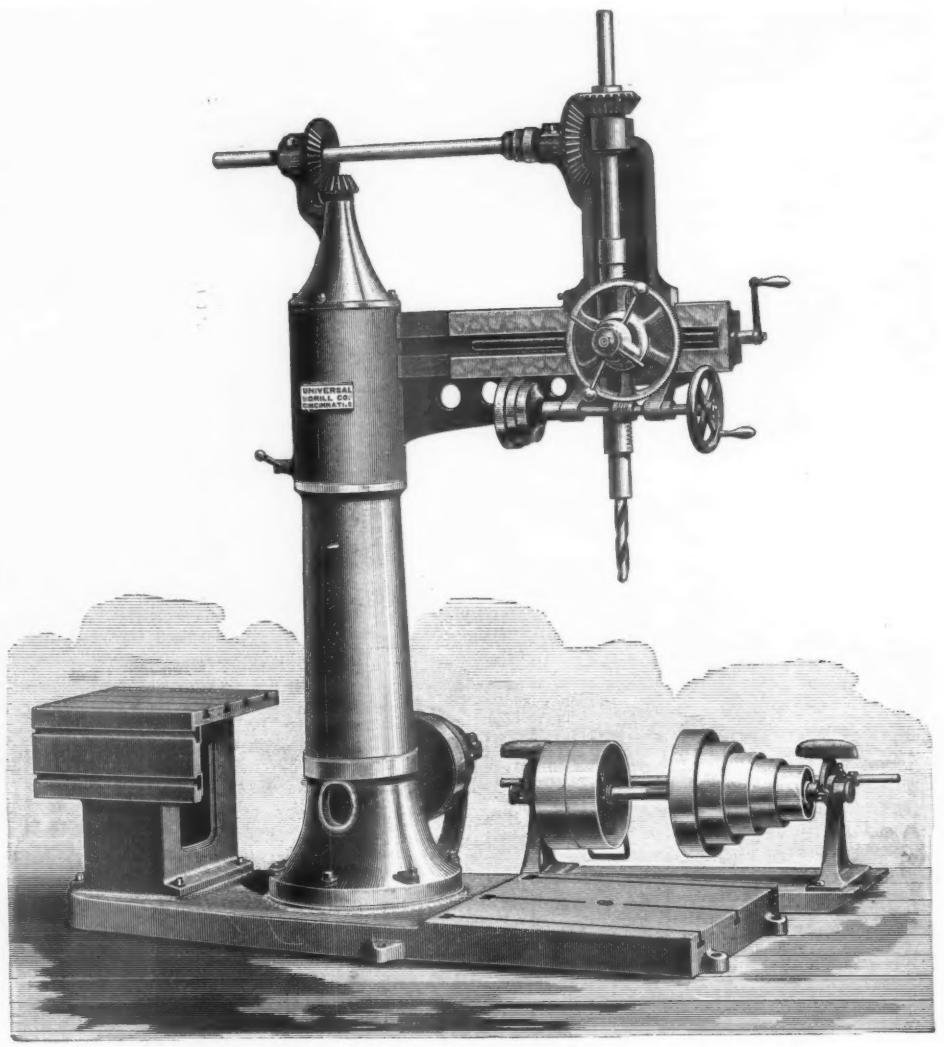
The total weight to be moved, including hotel, cars and locomotives, may be taken at about 13,000,000 lbs., or 6,500 tons. The wheels and rails being somewhat rusty, and the cars having been standing for a considerable time, the resistance was probably considerable, and without making any allowance for the friction of the ropes and blocks, may be taken at fully 15 lbs. per ton. The total resistance would therefore be 15 × 6,500 = nearly 100,000 lbs. The arrangement of the ropes and pulley blocks was such that the nominal leverage of the engines was 6:1, and as six engines were employed, it would appear that, neglecting the friction of the blocks, etc., a tractive force of only $\frac{100,000}{36} = 2,777$ lbs. exerted by each locomotive would keep the hotel moving. Probably this amount was fully doubled by the friction of the ropes and blocks, but it was evident that the engines were fully equal to their task.

The maximum distance the hotel was moved at one pull was 67½ ft., which was traversed in about three minutes. The hotel was moved a total distance of about 117 ft. on Tuesday, April 3, and a somewhat greater distance on the next day. A halt was then made and the track already traversed will be taken up and laid in front for further progress. The speed whilst in motion was about 20 ft. per minute or about ¼ mile per hour. The hotel has so far been uninjured, and it is stated that not even a ceiling has cracked or a pane of glass been broken, though all the windows are in place. The hotel moved without vibration, and the whole proceedings were conducted very quietly and with a commendable absence of fuss or excitement. The great crowd present included many ladies and readily moved out of the way when the tracks were cleared to enable a uniform strain to be put on the ropes before the locomotives began to move. When the signal was given the great hotel moved amid a silence broken only by the cheeping of the blocks and the gentle slatting of the falls upon one another and on the rails.

The operations of moving the hotel were conducted by the contractors, Messrs. Miller & Sons, house movers, and Mr. F. J. Morrow superintended the work on behalf of the owners of the hotel. The cars were supplied by the Iron Car Co. of New York. The work of preparation was begun last November, and the hotel will in all probability be in its new position by the middle of this month.

Radial Drilling Machine.

The accompanying engraving represents a form of radial drilling machine lately introduced by the Universal Radial Drill Co., of Cincinnati, Ohio. It will be seen from the engraving that the radial arm simply revolves round the column and has no vertical movement. This materially cheapens the first cost, and for many classes of work does not impair the usefulness of the machine.



RADIAL DRILLING MACHINE.

Made by the UNIVERSAL RADIAL DRILL CO., *Cincinnati, O.*

The spindle is geared with unusual power, has quick return, is counter-balanced, and has automatic feed. The drill will bore holes in cast iron up to 2 in. dia. The column which carries the arm, driving gear, spindle frame, etc., is bolted fast to the base plate, making it rigid and firm. The arm is pivoted at the top of the column, and has a radial movement over three-quarters of the circle. The table has both horizontal and vertical faces, and is provided with planed T slots.

The dimensions, weights, etc., are as follows:

Length of arm	3 ft. 6 in.
Greatest distance from sole plate to end of spindle	52 in.
Greatest distance from floor to end of spindle.	56 in.
Total height of machine, without countershaft	7 ft.
Total height of machine, including countershaft	8 ft. 6 in.
Total height of table from sole plate	20 in.
Size of table	20 in. × 20 in.
Diameter of spindle	1 15/16 in.
Size of hole in spindle, Morse socket, No. 4	1¼ with ⅝ taper.
Traverse of spindle	15 in.
Size of countershaft pulleys	12 in. × 3½ in.
Speed of countershaft pulleys, per minute	240 revs.
Width of belts on cones	2½ in.
Floor space required for base	78 in. × 44 in.
Weight, about	3,300 lbs.
Drills to centre of	68 in.

Test of the McElroy System of Continuous Heating.

An interesting test was had of the McElroy car heating system in Albany on Wednesday, the 4th. A large number of gentlemen accompanied the experimental train. Among those present were: H. G. Young, General Manager; R. C. Blackall, Superintendent Motive Power, H. C. North, Assistant Superintendent D. & H.; C. R. Eastman, Assistant Superintendent Adirondack; John Kinsey, Superintendent Motive Power, Lehigh Valley; F. D. Adams, Master Car-Builder B. & A.; J. E. Sague, Engineer of Tests N. Y., L. E. & W.; J. L. Cory, Master Mechanic D. & H.; J. White Sprong, Controller D. & H.; A. H. Caltin, Superintendent Air Brakes New York Central; Thos. Todd, Superintendent Motive Power Saratoga & Mt. McGregor; J. E. Doran, Division Master Car-Builder, and T. B. Purvis, of Motive Power Department, B. & A.; F. H. Soule, Line Inspector Binghamton, N. Y.; E. M. Greene, Director, and D. T. Thompson, Professor, Rensselaer Polytechnic Institute, Troy, N. Y.; Chas. D. Meneely, West Troy Bell Foundry; E. Mignaux, New York; W. B. Elmendorf, Agent Hudson Day Line; J. D. Brady, Paige Car Wheel; and J. L. McElroy and Dr. FitzHugh Edwards, representing the McElroy Car Heating System.

The train left Albany about 9:30 a. m., and ran through to Whitehall, N. Y., a distance of 78 miles, arriving there at 12:15, and after a stop of 20 minutes, during which time lunch was served to the guests, returned to Albany, arriving at 3:55 p. m.

The following was the programme, which was carried out almost to the letter:

Order of coaches in train: First, No. 8, 2d, No. 2; 3d, No. 1; 4th. No. 122; 5th, No. 66; 6th, No. 50; 7th, No. 9; 8th, No. 13; 9th, No. 16; 10th, No. 65; 11th, No. 67; 12th, pay car.

With 45 lbs., maximum pressure at locomotive, admitting to each car, steam sufficient to maintain a temperature of 70 degrees in zero weather, will show 25 lbs. pressure on supply pipe in 12th car from locomotive. This is understood to be after the cars are once heated.

Car No. 9 will run to Saratoga without steam being turned on system, after which steam will be turned on and circulation established in 25 minutes.

Cars No. 13, 16 and 65, with ventilators open, will be held at 90 degrees.

Cars No. 2 and 1 on return from Whitehall, with ventilators closed, temperature will be held at 65 Fah.

Car No. 122, at Green Island; water in Baker System will be blown off, when steam will be turned in empty pipes and pipes heated in fifteen minutes; after condensation has filled the pipes, fire will be started in Baker Heater.

Car No. 50; temperature will be held at 65 or 70 Fah.

Temperature in all other cars will be held at not less than 70 Fah.

The McElroy system was fully illustrated in the *Railroad Gazette* of Jan. 20, 1888.

The train was composed of an engine and 12 coaches. The engine was a standard passenger engine, 19 x 24 cylinders. Each coach was supplied with an improved Baker heater and the cars were all warmed before the engine was attached, except car No. 7.

The following record shows the amount of steam pressure on the pipes and the state of the thermometer in each car Observations were recorded half hourly, but the reading were so uniform that we have not thought it necessary to reproduce them in full.

CAR 1, COACH 8.

Time.	Pressure on train pipe.	Temperature.	Time.	Pressure on train pipe.	Temperature.
9	45	90°	2	20	78°
10	35	83	3	43	77
12	34	77	4	44	79
1	18	82			

CAR 2, COACH NO. 2.

9	45	75	1	18	73
10	36	81	2	18	70
12	34	75	3	43	69
12:30	21	74	4	44	71

CAR 3, COACH NO. 1.

9 35	75	1..... 5	68
16. 35	81	2. 11	68
11.....25	76	3.....36	71
12.....24	73	4.....30	70

CAR 4, COACH NO. 122.

9.....35	90	2..... 9	76
10.....28	90	3.....31	74
12.....19	77	4..... 27	74
1..... 5	78		

CAR 5, COACH NO. 66.

9.....45	88	2..... 5	72
10.....24	84	3.....30	72
12.....15	73	4 26	72
1..... 5	70		

CAR 6. COACH NO. 50.

9..... 30	70	1..... 5	72
10..... 22	70	2..... 5	69
11..... 16	71	3..... 24	69
12 20	72	4.....25	72

CAR 7. COACH NO. 9.

9 } No steam on		1. 4	80
11 }		2. 4	82
11.30. 25	84	3.....26	86
12..... 20	84		

Cut off and left at Green Island on the return trip.

CAR 8, COACH NO. 13.

10 22	72	1..... 3	78
11 18	86	2..... 5	88
12 20	91	3 20	90

Cut off at Green Island on the return trip.

CAR 9, COACH NO. 16.

10.....20	83	1..... 5	84
11.....18	80	2..... 3	78
12.....18	78	3.....14	80

Cut off at Green Island on return trip.

CAR 10, COACH NO. 65.

10 20	95	1 6	92
11 20	92	2..... 3	84
12 18	88	3.....14	88

Cut off at Green Island on return trip.

CAR 11, COACH NO. 67.

10 22	80	1..... 5	80
11..... 25	79	2 3	74
12..... 19	80	3.....15	80

Cut off at Green Island on return trip.

CAR 12, PAY CAR.

10.....15	76	1..... 5	76
11..... 24	82	2..... 3	82
12 15	80	3 12	86

The temperature outside was about 45°. It was unfortunate that the weather was not colder, but the tests demonstrated the principles of the system to the entire satisfaction of the gentlemen present.

Mr. Blackall speaks in the highest terms of the system, a train equipped during the past winter having given entire satisfaction. The couplers in use on this train have been on since last November and have not had any portion of them renewed.

In car No. 7, which had no heat on, the steam was turned on at 11:02, with a steam pressure on the train pipe of 25 lbs., and in 9 minutes complete circulation was obtained.

During the entire trip there was no leakage of steam, the coupler particularly receiving close inspection from all the railroad men. On the return trip, when the train reached Green Island the cars were separated to show the automatic action of the coupler with steam on and off. Another important feature is that condensation is held at stations until the train gets away, thereby obviating the drip that would otherwise occur.

At Green Island on the outward trip the water in pipes of the Baker heater in one car (No. 4) was blown out and direct steam let on. Later a fire was built in this same heater to show that the condensation had filled the pipes.

Although the day was warm, it was demonstrated that with 45 lbs. pressure on the locomotive, and with sufficient steam admitted to each car to warm it in zero weather, a pressure of 25 lbs. was maintained in the supply pipe on the twelfth car from the locomotive.

Mr. Cory, Master Mechanic of the Delaware & Hudson, under whose supervision the cars tested were fitted up, gave $65 as the cost for material and labor for fitting three cars, exclusive of royalty, but including everything else. It took 9 men 2½ days to do the work.

The McElroy Co. will furnish its coupler to railroad companies using other steam heating systems.

Some Legal Obligations of Railroad Companies in Strikes.

In the case of the Chicago, Burlington & Quincy Railroad vs. the officers of the Burlington, Cedar Rapids & Northern Railway, for an injunction restraining the latter company from refusing to receive Burlington cars and freight, Judge J. M. Love, of the United States District Court in Iowa holds, *first*, that such an injunction is a proper method of procedure. An action at law is so inadequate a remedy as to be really no remedy at all. The damages which can be awarded by no means covers the real damage to the business.

Second, that there is ground for an injunction in this case.

These defendants have appeared by counsel, and admitted the truth of the allegations of the bill, and they do not deny that they are required by law to receive and move the complainants' cars. They admit that they have refused to perform this duty, and they give as a reason for their refusal that if they receive and haul the complainants' cars, their firemen and locomotive engineers will abandon their places and leave them without the means of operating their lines.

There can, of course, be no doubt about the law of both the general and state governments requiring the defendant corporation to receive and move the complainants' cars, whether empty or loaded.

Now, the question is, What shall be obeyed—the law of the land or the order of the Chief of the Locomotive Engineers? Shall a railway company refuse obedience to the express provisions of the statutory law because some of its employés threaten to quit its service and thus stop the running of its trains? Shall the Court presume that they will carry out such threats, and deny relief to the complainant upon that presumption? No temporary inconveniences to the defendant company or the public whom it serves are in my judgment for one moment to be compared with the fatal consequences which must ensue from a precedent by which it would be established that a railroad company may, in violation of the law of the land, refuse to receive and haul the cars of a connecting line at the command of any irresponsible persons or from its own belief and apprehension that its employés will leave its service and stop the operation of its lines. Such an excuse as this is wholly inadmissible, and it must be set aside.

If, in this case, the refusal of the defendant corporation to move the cars of the complainant be sustained, it will follow that whenever in the future the locomotive engineers and firemen shall enter upon a struggle with any one road, all other corporations having connecting lines will, in violation of law, be warned not to interchange cars with the offending road and compelled to obey the behests of their employés. Thus may the transportation of vast regions of country covered by connecting lines be controlled and paralyzed at the arbitrary will and pleasure of the Brotherhood of Locomotive Engineers. Is this a power fit to be assumed and wielded by any set of irresponsible men under the sun?

Incidentally the Court says that the employés of the company may, perhaps, be directly subjected to the direction of the Court in the operation of an order like this: "They have assumed by contract to assist in the performance of a quasi public service—a service the non-performance of which may be ruinous to the public—and it is a serious question whether or not they may be compelled while remaining in the quasi public service of operating a railway to perform their duty."

The Lorraine Coupler.

A service test of the Lorraine coupler was made in St. Louis on the 27th ult. There were present a number of prominent railroad men, and others interested in such matters. Tests were made by coupling with one coupler open, then with both open, and running the cars together with both jaws closed. Tests of coupling with the ordinary link and pin were also made, as well as trials for coupling on curves. The accounts received indicate that the performance of the coupler was in all particulars very satisfactory.

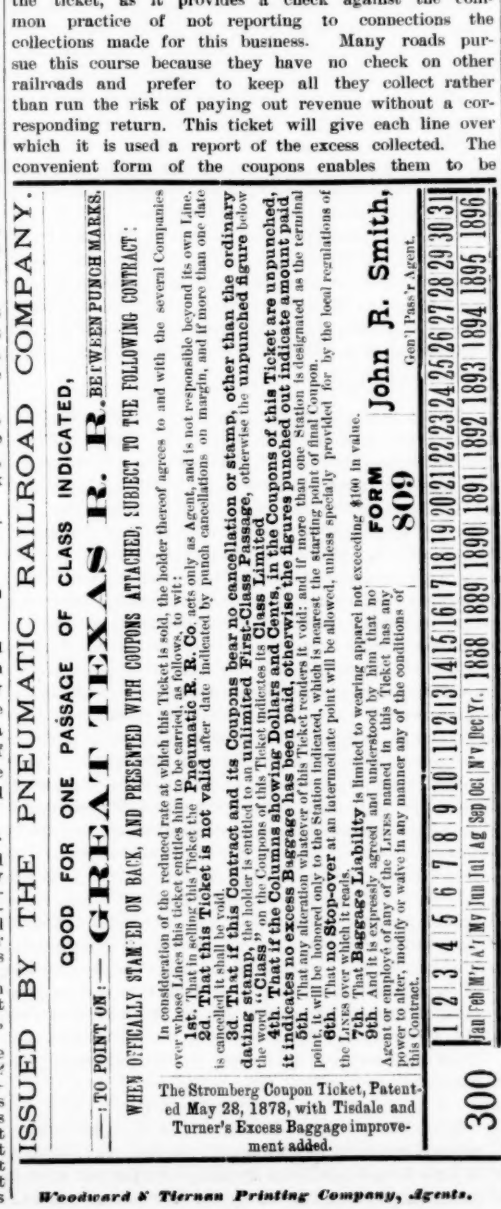
Tisdale & Turner's Excess Baggage Coupon.

The sample ticket shown on this page is nearly a fac-simile copy of the form devised by the above named gentlemen for the purpose of providing a practicable method of keeping a record of excess baggage collections. The following are some of the advantages claimed for this form:

All the printing except that on the ticket-seller's stub reads from left to right, and can be read without turning the ticket around. The ticket seller's stub is printed so that it can be easily read whether the ticket is in a case or hanging up. The coupons have two columns of figures representing dollars and cents, out of which will be simultaneously punched the amounts collected at initial points on excess baggage. This is the most important feature of the ticket, as it provides a check against the common practice of not reporting to connections the collections made for this business. Many roads pursue this course because they have no check on other railroads and prefer to keep all they collect rather than run the risk of paying out revenue without a corresponding return. This ticket will give each line over which it is used a report of the excess collected. The convenient form of the coupons enables them to be checked and audited with great facility. The usual forms have to be turned several times in order to be read.

It will be noticed that the coupons are arranged to fold so as to be punched at one operation, the dollars and cents columns which are arranged to be punched on the same plan employed in postal notes, being reversed on each alternate coupon. In folding, the baggageman's coupon is placed at the top. The punching of the figures on the first line would indicate that $11.11 had been collected. A punch with 1¼-in. throat will reach any point on the coupons.

A committee of the National General Agents' Association has the ticket under consideration, and information will be given concerning it by W. J. Turner, Mobile, Ala.


ISSUED BY THE PNEUMATIC RAILROAD COMPANY.
GOOD FOR ONE PASSAGE OF CLASS INDICATED,
—TO POINT ON:—GREAT TEXAS R. R. BETWEEN PUNCH MARKS.
WHEN OFFICIALLY STAMPED ON BACK, AND PRESENTED WITH COUPONS ATTACHED, SUBJECT TO THE FOLLOWING CONTRACT:
In consideration of the reduced rate at which this Ticket is sold, the holder thereof agrees to and with the several Companies over whose Lines this ticket entitles him to be carried, as follows, to wit:
1st. That in selling this Ticket the Pneumatic R. R. Co. acts only as Agent, and is not responsible beyond its own Line.
2d. That this Ticket is not valid after date indicated by punch cancellations on margin, and if more than one date is cancelled it shall be void.
3d. That if this Contract and its Coupons bear no cancellation or stamp, other than the ordinary dating stamp, the holder is entitled to an unlimited First-Class Passage, otherwise the unpunched figure below the word "Class" on the Coupons of this Ticket indicates its Class Limited.
4th. That if the Columns showing Dollars and Cents, in the Coupons of this Ticket are unpunched, it indicates no excess Baggage has been paid, otherwise the figures punched out indicate amount paid.
5th. That any alteration whatever of this Ticket renders it void: and if more than one Station is designated as the terminal point, it will be honored only to the Station Indicated, which is nearest the starting point of final Coupon.
6th. That no Stop-over at an Intermediate point will be allowed, unless specially provided for by the local regulations of the Lines over which it reads.
7th. That Baggage Liability is limited to wearing apparel not exceeding $100 in value.
9th. And it is expressly agreed and understood by him that no Agent or employé of any of the Lines named in this Ticket has any power to alter, modify or waive in any manner any of the conditions of this Contract.
FORM 809
John R. Smith,
Gen'l Pass'r Agent.
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
Jan. Feb. Mr'h. Ap'l. May Jun. Jul. Aug. Sep. Oct. Nov. Dec. Yr.
1888 1889 1890 1891 1892 1893 1894 1895 1896
300

The Stromberg Coupon Ticket, Patented May 28, 1878, with Tisdale and Turner's Excess Baggage improvement added.

Woodward & Tiernan Printing Company, Agents.

RAILROAD GAZETTE

Published Every Friday,
At 73 Broadway, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections appointments, and especially annual reports, some notic of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

Messrs. H. K. Porter & Co., the well known locomotive builders of Pittsburgh, appear to have been very successful in their plan of sharing profits with their workmen. Last year each foreman received from $125 to $300, and the machinists from $70 to $120, and the laborers from $45 to $60 each. The men are said to regard it as a cure for strikes, as the receipt of a dividend naturally makes their interests identical with those of their employers. When railroad strikes are so widespread and are so disastrous in their results, any cure would prove acceptable. Might not the example of Messrs. H. K. Porter be followed by railroads, and a certain percentage of net earnings be divided among the employés? The plan is worth trying, and the practical difficulties, although numerous, should be no greater with a railroad corporation than with a private firm. The latter having indeed a fluctuating amount of work have constantly corresponding fluctuations in the number of men employed, while the tolerably steady earnings and work of a railroad renders it seldom necessary to discharge a man except for misconduct or infringement of rules.

The Superintendents' meeting and the Time Convention, both of which take place in New York City next week, should call together a numerous representation of the operating officers of the country. While the superintendents have little work of importance laid out, except the elaborate list of questions propounded by its roadway committee; and the pre-arranged subjects prepared for the consideration of the Time Convention do not include the most important of those which are likely to come up, there is ample variety of topics which are of great interest to every person likely to be present, and the certainty of profitable gatherings of both organizations hinges only upon the readiness of members to ask about what they do not know and to tell about what they do know. The need of intelligent and deliberate conference among superintendents was never greater than it is now.

The uniform code will furnish any amount of material for discussion, as every one understands. Scores (or hundreds) of individual views have been interpolated or added to it as it has been put in use on various roads during the past year. The single case of the Erie, whose exhaustive treatment of the rules has been noticed in these columns, furnishes a number of interesting points, and the Fall Brook Coal Company's code, from which we have also published extracts, is of similar interest. A number of the latter's rules on points which the Time Convention committee did not embody in their report are worthy of the convention's attention. This gathering should not confine its discussions to rules or subjects which are equally applicable to *all* roads; those which are of interest or value to two-thirds, or even one-third of the lines of the country, deserve its attention. Nearly every individual officer has in his control lines or divisions of the most diverse characteristics; portions whose traffic is heavy and whose appliances correspond, and others which have to be worked under conditions very different. To fully investigate the bearings of the rules which are common to both these kinds of road and to remain entirely silent and inactive on all others is illogical. The trained minds of the committee should be availed of in both lines.

The best way of providing a safe rule at meeting points for fast passenger trains is one of the most interesting points connected with the application of the uniform code. Both Mr. Murphy and Mr. Brown deemed it necessary to modify this rule, though they both adopt the highest standard for watches. The adoption of the committee's recommendations concerning the make-up of time tables, the marks to indicate Sunday, regular stops, flag stops, etc., has not been so full and so carefully carried out as it should have been; the desirableness of improvement and uniformity in this direction ought perhaps to be more urgently advocated in the convention. Rule 71 was changed by the Erie; the reasons for and against the different views on this and some other changes should be more clearly set forth. The changes in Nos. 30 and 526, made by the Erie, are undoubtedly improvements, and should be brought to the attention of all. No. 103 is one which still needs further improvement. Mr. Brown, of the Fall Brook, gives more explicit instructions concerning the calling in of flagmen than do most superintendents. His rule on this point ought to be considered. The application of rule 68 to the case of trains approaching a flag station and signaled by either a fixed or a hand signal or by the gong has been suggested. The list might be extended almost indefinitely. The points that ought to be discussed are those concerning which talking members, who are present at the convention, have positive convictions.

The car-service question will perhaps be the most immediately important and practical topic in the minds of the attendants at the Time Convention, and many managers are looking forward to this meeting with great interest. The owners of substantially a third of the cars in the country have already made a good trial of the per diem system and the committee of the trunk lines has intelligently digested the criticisms which the past few months' experience has developed; so that roads with weak faith have much less excuse for hesitancy than they had a few months ago. To obtain the best results the new system must be generally adopted, and the roads that are using it should lay before the convention the statistics of their car performance thus far under the new plan, as compared with the same period of a year ago under the old system. These figures ought to give a pretty fair idea of the effects of the per diem plan as a car moving force.

The economy to be derived from compounding high pressure non-condensing engines is clearly shown in a paper by Mr. P. W. Willans, which will be found in another column. Careful experiments upon compound non-condensing engines are rare, and the influence of piston speed on economy has as yet been little investigated. Much light is thrown upon this point by Mr. Willans, who has been very successful in economical high-speed engines for steam launches and electric lighting. The bearing of his researches upon compound locomotives is obvious, while his conclusions as to the diminished cylinder condensation in high-speed engines are borne out by the remarkable results obtained in good locomotives worked under economical conditions. The importance of keeping the cylinder and steam chest warm, so as to minimize initial condensation, has hardly attracted sufficient attention among locomotive designers, and possibly explains the low consumption of English locomotives, in which most of the cylinders and all the steam chests are inside the frames, and are therefore tolerably well protected from radiation. The importance, however, of guarding against cylinder condensation by superheating, steam jacketing or compounding is being daily better understood. The exact nature of the operations of initial condensation and re-evaporation during expansion are, as yet, not clear, but Mr. Willans throws some light on the subject and gives some interesting figures as to the amount and nature of the loss from this cause.

The Massachusetts Railroad Commissioners have taken commendable action and, as they say, have as in duty bound fulfilled a special philanthropic trust in presenting to Congress an appeal for action concerning uniform couplers, freight brakes and heater couplings, and their invitation to commissioners of other states to co-operate has evidently met with enthusiastic response, as Congressmen from Connecticut, Minnesota and other states have already followed those of Massachusetts in presenting petitions, and there are doubtless others to follow. These petitions have been referred to the committee on Inter-state Commerce, and it is not unreasonable to hope that something definite may come of them.

The futility of legislation by separate states is recognized by every one, and the Massachusetts Commissioners do well to recognize the importance of the Master Car-Builders' Association's recent action and of Mr. Westinghouse's latest achievement. Their idea as embodied in their proposed resolution* is open to one criticism (which, however, is doubtless appreciated by the originators as well as by anybody), to wit, the lack of a proper National body to take up the question. The Inter-state Commerce Commission is probably named for lack of an appropriate tribunal. While the twelfth section of the Inter-state law gives the Commission power to inquire into the conduct of the business of all interstate roads, and the board is thus, by a strict construction of the language, given very full powers, there are many who will deny its authority over technical questions like those under consideration, and the intention of Congress in framing the law and of the President in appointing the Commissioners undoubtedly left all mechanical or scientific considerations wholly out of the question. The Commissioners themselves would doubtless be the first to object to this enlargement of the scope of their work, for other and obvious reasons besides the fact that the narrow line already entered upon furnishes much more work than they can keep up with. A special commission might be appointed or the present board might be enlarged. The British Board of Trade affords ample suggestion of the valuable work that might be done in this country by a commission with broader powers if we could be as successful as the English have been in preserving its integrity.

The Rail Head.

On another page we publish a second communication from Mr. White, in which he touches upon the subject of train resistance as affected by the shape of the head of the rail and upon several other topics. It is hardly necessary now to add anything to our editorial of two weeks ago. We quite understood Mr. White's position that there is little flange friction at any time, and that such as there is occurs when the engine is not pulling. And we quite understood his deduction that the sloping side of the rail head is not a source of waste of tractive power. We did not intend to imply that Mr. White thinks that the wheels of a train are drawn *against* the inner rail of a curve, but to show from often observed examples that as a matter of fact some of them are, under most conditions, thrown against the outer rail, and that, therefore, there will be friction against that rail while the engine is pulling. Without inquiring far we should say that there is hardly any respectable authority who will not agree that the resultant of the forces acting in a moving train will carry the wheels forward on the tangent to the curve at any given point, unless the speed is very low. As the truck stands askew the outer front wheel and the inner rear wheel should bear respectively against the outer and inner rails, but observation of the wear of rails confirms the theory that the inner wheel of the truck ordinarily does not press laterally against the rail; indeed, we may safely say that it very seldom does. Now, whether or not the flange friction against the outer rail is "considerable," depends upon several conditions, and many ingenious efforts have been made to determine it, but whether it is much or little, it is apparent that it will be least, other conditions being equal, when all of the work of resisting the outward thrust is done along a line with which the fillet of the wheel is in rolling contact, and greatest when that part of the flange which *rubs* against the rail head is furthest from the line of rolling contact.

As to the tendency to increase the side angle, we compared the practice of to-day not with that of a dozen years ago, but with the more recent sections, and although the vertical side was largely given up, we think that we see promising signs of a

* *Resolved*, That the Inter-state Commerce Commission are instructed to consider what can be done to prevent the loss of life and limb in coupling and uncoupling freight cars used in inter-state commerce, and in handling the brakes of such cars, and in what way the growth of the system of heating passenger cars from the locomotive, or other single source, can be promoted, to the end that said Commission may make recommendations in the premises to the various railroads within its jurisdiction, and report its doings to Congress, at an early date, with such suggestions as to legislation on said subjects as may seem to it necessary or expedient.

return to it. The Pennsylvania rail, shown in this issue, has an angle of four degrees; that of the New York Central, shown last week, has three degrees as nearly as could be determined from the drawing; Mr. Sandberg's standard sections have vertical sides, and the Mattes' 88-lb. section, cited by Mr. White, has six degrees and not ten. Mr. Mattes himself says that "it is undeniable that excessive side-slope leads to excessive wear," and apparently he adopted the six degree slope rather because he did not anticipate any serious opposition to it than from any very thoroughly studied reasons for it. It is hardly necessary to go over the arguments, which lead one to conclude that wear will be more rapid where the flange and the rail head are rubbed against each other to a considerable distance from the point of rolling contact, or to refer the reader to the various examples of excessive side wear which have been shown within the last year or two; but it strikes us that the Dowlais section which Mr. White gives shows, so far as it shows anything, the advantage in this particular of vertical sides, for apparently the sides of that rail head had but little inclination to the vertical.

Mr. White's diagram does not convince us that there is no greater liability to derailment with inclined than with vertical sides. If the leading axle of a truck were normal to the curve the assumption that the flange will not begin to mount the rail until the angles shown in the diagram are equal would be well enough, but, as a matter of fact, the outer front wheel encounters the rail at an angle. It is immaterial to this discussion whether the radius of the curve passes through the centre of the truck, or along the line of the rear axle: it is quite certain that it does not lie along the front axle. Therefore, the wheel meets the rail at an angle, and the greater the flare of the head the sooner will some point or line on the flange get a bearing and tend to raise the wheel. Obviously, this tendency is increased with sharp flanges; and on sharp curves, or at low places in curves, or with light loads and high speed, it may become a source of great danger.

The Strike.

The events of the past week at Chicago have shown that the condition of things is substantially the same as that which existed there two years ago. The body of men who run the switching trains apparently includes a large element of fighting rowdies, and in any situation where they see an opportunity to turn upon their employers they are at once willing to adopt the methods of the ruffian. Switchmen have struck at other points on the Burlington road and there is evidently an understanding between the striking engineers of that road and the switchmen. There must be a secret "deal," and the statement that the less conservative element of the brotherhood has negotiated with the switchmen without consulting the chief officers appears to have a basis of truth. Chief Arthur says that the brotherhood has no relations with the striking switchmen; and the only avowed grievance of the latter against the Burlington—that the men running the switching engines are incompetent and unsafe to run with—furnishes no reasonable pretext for a general strike. It is absurd on its face. The strikes on the other roads are wholly sympathetic and avowedly so. We summarize in another column what we can gather from the dispatches, but there is nothing in them which shows a shadow of reason for the strike. The men were evidently spoiling for a fight and a little provocation sufficed to start one.

With the widening of the strike, wider questions of public policy come more distinctly into the foreground. The original matter at issue between the Burlington and its striking engineers drops out of sight. The law concerning the real points at issue is explicit. If any doubt remained, the decision of Judge Love, which we quote in another column, ought to set the matter at rest. The employés of the connecting roads are simply trying to compel the companies to do an illegal thing. They strike because the railroads will not violate the law. If anything is unlawful combination, this certainly is. It is easy to say that the employés have no right to take such a position. Unfortunately a mere statement of the law on this point helps us very little. What are we going to do about it? The difficulty is not in any lack of explicit law, but in lack of the means of enforcing it. It has been proved over and over again by actual experience that the attempt to compel men by law to do their work may cost more than it is worth. In fact, as long as local public opinion upholds a trades union in some of its acts, it is difficult to interfere with its members except to prevent actual violence—and not always easy to do that.

But if the workman can thus defy the law, it complicates the position of the companies. Suppose the Rock Island officers should boldly say: "Even granting that our conduct is unlawful, we are forced into it. If we obeyed the law, our men would disobey it. We should lose more by their unlawful conduct in that case than we possibly can by our own refusal to handle Burlington freight." What would then be done? Judge Love more than hints that it might be necessary to push the responsibility of such a road to its utmost limits; not merely to subject its officers to an injunction, but to hold the company liable to indirect damages for goods in transit.

The only permanent remedy for this uncivilized and dangerous state of affairs is more enlightenment. Public opinion must be educated. The right or wrong of strikes has nothing to do with the question. No new law is needed, but rather the enforcement of those already on the books. If the citizens do not realize their danger and the necessity of providing an efficient executive and judiciary, the truth will sooner or later be forced upon them and possibly by violence. In Pittsburgh, in 1877 and the years following, public opinion was educated by having to pay heavy damages for sympathizing with riots. We do not believe that matters will go as far in this case, or that the process of education will be of the same sort. But the parties who violate the law, whether ignorant employé, short-sighted employer, or the careless public, will sooner or later have to reap the fruits of this violation—if in no worse way, at any rate by loss of railroad service, railroad employment, and railroad facilities.

The workmen have been encouraged in their lawless methods by important railroad companies, and even if the present trouble is patched up, as seems at this writing probable, the fruit of this policy will surely react some time. The men have followed rash counsels, but how much less short-sighted have their superiors been? The troubles of two years ago afforded a clear warning, and, from statements recently made, the men on the Lake Shore, which had the most trouble then, seem to remember the lesson learned. But roads which did not suffer at that time apparently paid little heed. One who builds on a volcano must take the consequences. A railroad manager in engaging a private secretary or a house servant looks at the candidate's character as well as his skill or ability. Events at Chicago show that the rule applies to brakemen as well. Whatever may be said about the different conditions in the dissimilar cases named, the fact remains that too little attention has been paid to the moral side in the hiring of these "toughs." The captain of a ship with a brace of pistols in his belt can perhaps manage his craft successfully with a force composed of plug uglies or even murderers; but a railroad superintendent, dependent upon men's honor to keep his ship a-sailing, can not.

Engineers and Public Works.

In December, 1885, delegates from ten societies of civil engineers of the United States held a convention at Cleveland, and met again in March, 1886, when they effected a permanent organization under the title of the Council of Engineering Societies on National Public Works. The membership of the ten societies which were represented was at that time nearly 2,700, and the executive board of the Council states that many members of the American Society have personally expressed their favorable interest in the objects of the Council, and that the total number who have, in one way or another, expressed their approval of these objects is over 3,000. The Council was organized for the purpose of bringing about some reform in the method of carrying on the public works of the country, and for the further purpose of introducing into the active control of these works civil engineers, in such way that they may take rank with the army engineers and receive the same consideration. The Council has secured the introduction into both houses of Congress of a bill, known as the Cullom-Breckenridge bill. We gave in our issue of Feb. 10 a very brief analysis of this bill, indicating its important features. The Executive Board has recently published a pamphlet in which are collected facts concerning the organization, the memorial to the President, the text of the bill, with proposed amendments, some information concerning the way in which the appropriations have been made and expended heretofore, and brief papers on the organization of the public works departments of France and Prussia. This pamphlet may be obtained from the President, L. E. Cooley, 171 La Salle street, Chicago, or the Secretary, John Eisenmann, 29 Euclid avenue, Cleveland. It is the first of a series of three which the Council propose to issue. The second "is designed to present matter bearing upon the broad question involved. It will consist of reprints from various sources," and the third "will present the official record of proceedings of the Council and its Executive Board."

The agitation which preceded the formation of the "Council," and which that body has carried on with commendable persistence, has had in view the reorganization, or rather the organization, of all that part of the public service which has to do with the design, construction and maintenance of national public works. The convention which assembled at Cleveland recommended that "Congress should be asked to establish a civil bureau of public works."

It is obvious that a change which should bring all public service of an engineering character under one department would involve something like a settled policy as regards public works of survey and construction, and that in the present state of public opinion there could be no such policy adopted. Furthermore such a change would encounter opposition from several conflicting interests which have more or less popular strength. To be successful, also, it must be accompanied by the general acceptance of a theory of the civil service very different from that which has long prevailed. That is, a national department of public works must be entirely removed from politics. So long as public opinion and prevailing practice could allow such a department to be used for political ends it is better to leave matters as they are and to put up with the present unsystematic, vacillating and wasteful methods. This must have been widely recognized. No doubt many men who would have entered with enthusiasm into a comprehensive scheme for the organization of something more or less like the Bureau des Ponts et Chausées of France, or the Prussian public works department, have been deterred by the fear that it would but add to the "spoils" of the party victorious in each national campaign. The greatest merit of the system which puts in the War Department the expenditure of the money appropriated for river and harbor improvements, and for the construction and maintenance of lighthouses, and which puts the work in the hands of army officers is that the work is carried on and the money spent by a body of men who are incorruptible, and who cannot be controlled by any party. The basest jobbery may enter into the construction of the annual River and Harbor bill, but we all know that the appropriations will be honestly, if not always most wisely, spent; and we should be thankful that we have one body of public servants who are governed in their public life by the old-fashioned notions of honor and duty. It is undoubtedly true that a high sense of professional honor and of faithfulness to trusts assumed exists also among civil engineers as a body. But this highest professional spirit, together with high professional ability, can only be secured for the public service by some system of appointment, and some security of tenure very different from anything now known in the civil service. To these ends the efforts of the Council of Engineering Societies have been directed, and the bill which has been formulated seems well calculated to establish a corps from which may be developed a creditable and efficient national department of public works.

Perhaps the Council recognized the uselessness of pushing at present the whole comprehensive scheme which was at first contemplated. At least the legislation now proposed is intended to create only a Bureau of Harbors and Waterways, and is well designed to test the question whether the country is ready to begin the reform aimed at by the Council, and on the lines suggested. The bill now before Congress is constructed to create a corps as nearly non political as possible, the members of which would have the same incentive to faithfulness to public duty that army officers have. Service in the corps is to be for life; promotion is to be by seniority, dependent only upon examination and provision is made for retirement on half-pay. An appointment in the corps would be a provision for life, and would be eagerly sought for and highly prized. A man holding it could not afford to do anything that would lead to disgrace or dismissal. It is fair to suppose that were such a corps established there would soon grow up amongst its members much of that spirit which has made the officers of the Engineer Corps of the army the most scrupulously honorable body of servants the nation has ever had.

Care has been taken to frame the bill in such way as to prevent frittering away money on works which cannot be completed, or be at least put in durable and useful condition, with the fund appropriated or provided for. It is "the purpose and intent of this act that no power or discretion shall rest with the engineers or War Department to spend public money when they know and admit that the amount applicable

to a work is insufficient to serve any useful public purpose." It is not the Secretary of War or the engineers, however, against whom the country needs protection, but Congress. The officers employed on river and harbor work have pointed out repeatedly the wastefulness of the system of appropriating and spending money according to the needs of politics, and without regard to the requirements of commerce and good engineering, but the log rolling method still prevails, and this year the House Committee brings in the largest bill ever reported, appropriating $19,432,783, judiciously distributed among the constituencies.

The Cullom-Breckenridge bill is designed to give civil engineers co-ordinate power with army engineers, and will be opposed by some of the latter. It is designed to make the new bureau non-partisan, and will be opposed by those who would regret to see such a fine machine useless for politics. It would put the river and harbor appropriations on a rational, scientific basis, and will be opposed by those who wish to "distribute the surplus" on a sentimental plan. But for these very reasons, if for no other, it deserves support.

The Adoption of Uniform Car Couplers.

Some of the New England roads still appear to hesitate to adopt the M. C. B. type of coupler and are equipping new cars with some form of link coupler, both the automatic and non-automatic types being used. The Fitchburg is equipping some new cars with the Perry* and the Boston & Maine is at this late date adding to the number of Saffor d draw-bars already in use. While both these couplers undoubtedly have certain good features, it cannot be sufficiently emphasized that the retention of the link simply delays improvement and prolongs the dangerous transition period of change from the link and pin to the vertical plane type.

The benefits to be derived from the general adoption of vertical plane couplers have been fully demonstrated, and are acknowledged by a majority of the railroads of this country. Not only is greater safety secured, but cars are coupled more easily, while the elimination of link slack enables heavier trains to be started and diminishes the jerks and shocks which are so injurious to both cars and freight. The vertical plane principle also allows each car to have an independent vertical movement over a rough track, and does not throw the weight of a low or heavily laden car on the draw timbers of the next high or empty car. These four features are overwhelming arguments in favor of the vertical plane type of coupler, and have led to its adoption by those who have had considerable experience in its use. The immense advantage of having a *uniform* type of coupler on all the freight cars of the country is, however, a further point to be gained.

The disadvantages of a want of uniformity in couplers have been only too apparent in the past. Were all common drawheads of uniform height and pattern and all links and pins alike, the disadvantages of the present system would possibly not have been so glaring as to compel a change. It is now possible not only to secure uniformity, but the important and additional advantages enumerated above, and it seems strange that any progressive roads at this stage of the coupler question should try experiments with forms of couplers that are not in accordance with the standard adopted by the majority after exhaustive trials and discussion.

The benefits of the M. C. B. type of coupler cannot be fully obtained until it is generally adopted. If ten cars equipped with vertical plane couplers are scattered in a train of forty cars, thirty of which are equipped with various forms of link couplers, the increased safety and convenience will be inappreciable; but if the proportion be reversed, the difference will be considerable, and similarly the more widely and quickly link couplers are replaced by the better type, the sooner will the benefits of the change be realized.

A want of uniformity does not impair the usefulness of many improvements. One road may adopt the extension front on its locomotives and another the diamond stack, but the benefits of the extension are not impaired because a neighboring road does not see matters in the same light. But this is not so with couplers. Uniform couplers, like uniform gauge, are essential. The hearty co-operation of every road is needed to secure complete success, and it should be the aim of all concerned to join in the forward march of improvement and not to straggle behind.

Mail Transportation.

The question of the proper rate of compensation for carrying the United States mails seems not to excite a very lively interest among railroad managers, perhaps because the task of convincing Congressmen of what is right and what is not is deemed a hopeless one; but there can be no doubt that the subject is important, as was shown by the communication printed in these columns on March 23. Bills embodying all sorts of absurd provisions and based on principles of all degrees of fairness and unfairness, are proposed in Congress and are allowed to pursue their course unchallenged; and they are liable at any time to become law, almost before the railroads know of their existence. The government virtually adopts the methods of the absolute monarch; for, although committee hearings are held and inquiries are sent around to the railroads, the final decision is so very likely to rest with men who do not possess, and do not take the pains to acquire, a knowledge of the principles on which a railroad should raise its revenue from the service it performs, that the possibility of a just law, based on enlightened principles, is always uncertain. We cannot now discuss the merits of the question, as, like other transportation problems, it is considerably complicated, the variable cost of performing the service on different roads, the difficulty of keeping exact records of the volume of traffic, the exigencies of localities, and other factors, rendering the deduction of an equitable law a work of some magnitude; but for the purpose of giving an intelligent exhibit of the present status of the matter, we give below a statement which has been furnished us by Mr. Henry Fink, Vice-President of the East Tennessee, Virginia & Georgia, who has made careful studies of the whole subject. Mr. Fink says:

Railroad managers should remonstrate against the great injustice that would be done to their companies if Mr. Townshend's bill for the readjustment of mail compensation should become a law. It is evident from the recommendations that have from time to time been made by special committees, and from the bills that have been introduced in Congress, that serious misapprehensions exist as to the principles that should govern in fixing a just and reasonable compensation to the railroads for the transportation of the mails. The special commission on railway transportation appointed under act of Congress of July 12, 1876, after an investigation extending over a period of 19 months, failed to agree in its conclusions, and submitted a majority and a minority report. However, I think both the majority and minority agreed to base the compensation upon the actual cost of transportation per lineal foot of passenger train per mile; and they actually undertook to ascertain such cost by dividing the total operating expenses of 114 railroads by the total mileage of *freight and passenger trains*, and then dividing the alleged cost per passenger-train mile so ascertained, by the estimated length of passenger trains. It is stated in the minority report that it appears from full returns obtained from 114 roads of the business of 1876, that the average cost of transporting a car without profit or interest on cost was 23.10 cents, or 4.62 mills per linear foot per mile run, that the average receipts per car were 33.55 cents, or 6.71 mills per linear foot per mile run; and these figures were taken as the basis for the recommendation of the commission. And it is recommended by the minority that 45 per cent. be added to such cost for profit, and that the Postmaster-General obtain from the railroads every four years returns of their expenses, and add such percentage of profit as shall give a fair compensation. Until the cost shall have been so ascertained by the Postmaster-General the minority proposes as compensation for each linear foot of car used for railway mail purposes running at a speed of:

23 miles per hour and under	5·82 mills.
24 " " "	5·87 "
25 " " "	5·92 "
26 " " "	5·97 "
27 " " "	6·07 "

and so on.

The minority also recommended that the so-called side service be discontinued—that is, that the department shall deliver the mails and the railroads shall receive them at stations, or pay the railroads a reasonable compensation for such service.

It would seem that the commission was not only confident of its ability to ascertain the cost of performing any particular railroad service, but did not hesitate to recommend that such average cost be made a basis of compensation. Fortunately their recommendation did not receive the endorsement of Congress.

Under an act approved March 3d, 1883, the Postmaster General appointed a committee and directed it to frame and submit a system for gauging the rates of pay for carrying the mails on railroad routes. The committee so appointed prepared and mailed to every railroad corporation in the country, then carrying the mails, a letter, soliciting a reply in reference especially to two points, viz.:

1st. What a proper basis of compensation would be.

2d. What rates of compensation should be fixed for the service.

In my reply to that committee, I insisted that railroad tariffs are not and can not be based upon actual cost of transportation, that the cost of performing any particular service cannot be ascertained with any reasonable approximation to accuracy, and that even if it could be ascertained, the railroad tariffs cannot be based upon the cost but upon the value of the services rendered. I insisted that the Post Office Department should contribute at least as much towards the revenue necessary for the support of the railroads, in proportion to the character and amount of the accommodations and facilities it demands, as other customers of the railroad companies, and that a railroad company should not receive less for the transportation of the mails on fast trains than it receives for the transportation of pig iron on its freight trains. I called attention to the fact that the Government is competing with the express companies, and indirectly with the railroad companies, for the small parcel and money business, and that so long as the government undertakes to fix its own rates upon such business, it should not deprive the railroads of a legitimate source of revenue. For it is to be supposed that a great government would not desire to put itself in the position of a so-called deadhead, by requiring services of railroad companies without adequate compensation.

It appears from the report of the committee appointed by the Postmaster General that it has discarded cost as a basis of compensation, and substituted as such basis the average revenue per linear foot of passenger trains in six states, that is, in Illinois, Pennsylvania, Massachusetts, Ohio, Iowa and Michigan. It ascertained that the roads of these states earned 26.6 cents per passenger car mile run, and the commission states that it is convinced that the average yield per passenger car in the whole country cannot be very far from 26 cents per car per mile run, and that therefore five mills per linear foot per mile run, or a rate of 25 cents for a 50 foot car at an ordinary speed of 20 miles per hour, would be a just and reasonable compensation to the railroad companies. And the committee recommends:

1st. The closed or pouch mails now carried in express or baggage car, without postal clerks accompanying them, requiring no space for distribution *en route*, shall be paid for on the following basis, viz.: the aggregate weight of the closed or pouch mails carried on any road on all trains for 24 hours shall be made the basis of pay, and this aggregate reduced to an equivalent in linear feet of car space in the following proportions:

200 lbs. of mail or less shall be rated as the equivalent of 6 linear inches, to be paid for at the rate of 5 mills per linear foot per mile run.

500 lbs. of mail shall be rated as 1 linear foot, and for each additional 500 lbs., 1 linear foot of car space shall be allowed, with the provision that the pay for the transportation of mails upon any railroad route for six round trips per week shall not be less than $35 per mile per annum.

2d. That the side service shall be discontinued.

3d. That the pay for railway post-offices at a speed of 20 or less miles per hour between termini be 5 mills per linear foot, inside measurement of car space per mile run, and for each increase of speed amounting to two miles per hour, up to and including 30 miles per hour, $\frac{1}{10}$ of a mill, *i. e.* 22 miles per hour, $5\frac{1}{10}$ mills; 24 miles per hour, $5\frac{2}{10}$ mills, 26 miles per hour, $5\frac{3}{10}$ mills; 28 miles per hour, $5\frac{4}{10}$ mills; 30 miles per hour, $5\frac{5}{10}$ mills, and for each additional mile per hour $\frac{1}{10}$ of a mill.

That in the adjustment of space by linear feet for railway post-offices, a daily average of 500 lbs. of mail or less shall be entitled to pay for space not to exceed 13 ft.; from 500 to 1,000 lbs. space not to exceed 15 ft.; from 1,000 to 2,000 lbs. space not to exceed 25 ft.; from 2,000 to 4,000 lbs. space not to exceed 40 ft. That no change in the allotment of space shall be made until the average weight reaches 6,000 lbs.; for 6,000 lbs., 50 ft.; for 8,000 lbs., 60 ft. The weight to be ascertained by a weighing of not less than 30 consecutive days. And no additional space shall be paid for unless it is found to be necessary.

I have not seen a copy of Mr. Townshend's bill, but I infer from the communication that appeared in your issue of March 23 that it embodies some of the recommendations of the committee appointed by the Postmaster General. There can be no doubt as to the fact that, the proposed compensation to the railroad companies under this bill is unjust and unreasonable.

The Car Service Rules.

An examination of the amended rules for settlement of car service, adopted by the Trunk Line Special Committee, and published in our last issue, will reveal the fact that the per diem plan in operation is already asserting an influence for accurateness of record and uniformity of action. There is a widespread notion that the unsatisfactory performance of cars is almost entirely due to the failure of consignees to handle them promptly, but practical car service men are more and more convinced that the loose manner of keeping car records, and the great diversity of organization and methods employed have been important factors in the delays experienced—in short that the administration of car service has not received the attention which its importance merits. This early manifestation of improved methods incident to the new system, must therefore be taken in confirmation of the promises made for the per diem plan by its advocates as a system that would produce better results in more than one feature of the business affected by it.

Rule 9, which provides for the taking of receipts for all cars interchanged at junction points, must result in an agreement of record by the respective roads, and the locating of responsibility for delays so prevalent at junction points by reason of waiting for billing, inspection, etc., which cannot but work decided improvement. Rule 10 provides that the delivery of cars to connections is effected when they are placed on a recognized delivery track, or in case such track be full, the delivery is effected when the cars are placed on the nearest available adjacent track and the receiving road notified; and it is especially intended to apply, when through operating, physical or mechanical defects, or other obstruction, a blockade is produced and the receiving road fails to promptly accept cars offered, and to place the burden of expense and responsibility for the delay where it properly belongs. The practice of putting up the bars at junction points is no doubt often resorted to without adequate reason, and narrow-minded, careless or unprincipled agents have always had here an opportunity for a variety of slippery practices which this rule should do away with. A regulation of the kind has long been needed, regardless of the new system.

Rule 11, providing for notification of a blockade, is correct in principle, as every road certainly has the right to refuse cars which it cannot handle, while at the same time the notice cannot justly be given after freight has started; but whether it will work in cases of long-distance traffic we are not so sure. In specific cases the application is simple enough. If the New York Central wishes the Chicago & Northwestern to suspend flour shipments from St. Paul, for John Jones

* This road was erroneously stated to be applying the Safford in a recent issue.

Rochester, a notice can be sent the C. & N. W. accordingly, but such notice will not affect cars in transit or those which may be loaded within 24 hours of its sending, and it is a question whether any general improvement will be realized in this direction. For some short-distance traffic, however, as in many cases of coal shipments to places with limited yard room on roads with meagre facilities it should be possible by means of this rule to avoid serious difficulty. The question of empty cars, as we intimated last week, is not so easily settled. An empty car can be easily converted into a loaded one, and the trick can be varied where there is a large traffic by sending out one's own cars heavily loaded while returning those of other roads with lamp chimneys or baby carriages; so that selfish and grasping officers will never lack for methods of meanness. Practical lessons in honorable treatment of one's neighbor will not be wasted in railroad offices, though, and a trial of this rule should certainly be made. The committee in charge of this work has certainly taken hold of the subject in a businesslike manner, and the advice it gives should be followed.

The following table gives the locomotive performance for the year 1887 on all divisions of the Cleveland, Columbus, Cincinnati & Indianapolis and Indianapolis & St. Louis railways:

Miles of road operated		789
Total No. of engines		233
No. making mileage		233
Miles of road per engine		3,101
Engine mileage.		
Passenger		2,583,040
Freight		3,458,931
Working		2,629,394
Total mileage		8,669,365
Miles run to.	1 pt. lub. oil	23.68
	1 ton of coal	29.69
Cost per mile run.		Cents.
Repairs		3.56*
Oil and waste		.26
Coal and wood		4.03
Eng'r and firemen		5.67
Disp. and cleaners		.26
Water supply		.45
Other M. P. accounts		1.30
Total cost		15.53
Coal consumption.		Lbs.
Lbs. coal cons'd per engine mile	Pass.	55.2
	Fr't	92.3
Lbs. coal cons'd per car mile	Pass.	12 2
	L'd fr't	3.9
Car mileage.		
Passenger		11,770,456
Loaded freight		80,972,411
No. cars hauled per ton coal	Pass	165.2
	Ld. fr't	507.7
Cost per car per mile in cents	Pass	2.79
	Ld. fr't	.65
Average train.		
No. cars, pass		4.6
No. pass., pass		35.5
No l'd cars, fr't		23.4
Av. load, fr't		210.4 tons.

Empty freight cars form 20 per cent. of all the freight cars hauled. Five empty freight cars are reckoned as equal to three loaded cars. Train engines are allowed time card mileage, and switching engines are allowed 6 miles per hour.

The results of the year's working of the locomotives are very good and reflect great credit upon the General Master Mechanic, Mr. W. F. Turreff, and his staff generally.

There has been a steady reduction in the cost of electric lighting since its introduction a few years ago, both actual and as compared with the cost of gas. The following figures supplied by the North British Railway of the cost of lighting the Waverly station at Edinburgh are interesting as showing how much cheaper it is becoming. The company operates its own plant. The figures are for the last half of 1884 and 1886, respectively:

	1886.	1884.
Arc lamps	39	33
Lamp hours	55,068	41,884
Wages	$948.03	$801.93
Carbons	304.25	608.86
Repairs	379.82	228.08
Coal	114 73	319.42
Oil and supplies	42 39	134.31
Interest and depreciation	200.98	252.20
Total	$1,990.20	$2,344.80
Net saving	354.60	

The cost per lamp hour in the first case was $0.056, and in the second $0.036. It will be seen that there has been a great decrease in the cost of carbons, coal and supplies, and a small decrease in the interest account (though how this comes about is not stated), while the cost of wages and repairs has increased. The saving is largely due to the great fall in the price of carbons, which cost now not more than one-third as much as in 1884. Besides the arc lamps, there were in the latter year 148 incandescent lamps of 10 and 17 c. p. distributed in the waiting and refreshment rooms, and the suburban station. The number of lamp hours for these was 171,251, and the cost was $404.07; 113 lamps were renewed, giving an average life of 1,515 hours.

A sugar refinery at Leith was formerly lighted by gas at a yearly cost of $1,682.70. Two years ago incandescent electric lights were substituted with the result that, for the year ending May, 1887, the cost was $987.44, a saving of $695.26, or more than 40 per cent. There are 180 Brush-Victoria lamps of 10 and 17 c. p. The dynamo runs from Monday a. m. to Saturday p. m. night and day without stopping, and during the two years it has been in use there has not been a failure.

An abstract of the 24th annual report of the Chicago, Milwaukee & St. Paul is given on another page. It will be seen that this great system of 5,670 miles of main track, or 6,838 miles of total track, increased in the last year of unprecedented new construction but 372 miles; and it is announced that all new construction on the system was practically finished and no new work has been authorized or undertaken since. Practically all of the mileage of the system is owned absolutely by the company, only 60 miles being owned jointly with other companies. The results of operation show a continued and serious decline in rates. A table of rates received per ton per mile for 13 years is given, showing a decline in almost every year. From 1882 to 1887 the rate fell 26.35 per cent., and from 1877 to 1887, 47.6 per cent. Last year it was 1.09 cents per ton per mile. The result is that while the gross earnings last year were the largest ever made, and 2.6 per cent. greater than in 1886, the net earnings are 1.2 per cent. less than those of 1886. It is true, however, that the operating expenses increased 5.2 per cent. The average miles operated increased 7.6 per cent.

Of about one million tons of coal used by the company in 1887, about 60 per cent. was from the mines owned by it. It is estimated that the coal not yet mined in the properties of the company amounts to about 22,000,000 tons. The cost of these coal lands is reduced monthly by a sinking fund charge as the coal is mined, the plan being to thus charge off the entire cost of properties and improvements by the time the mines are exhausted.

The Philadelphia & Reading Terminal Company is to be organized with a capitalization of $7,000,000, and there is little doubt that the project for a terminal station in the heart of the city will be carried out. This, of course, involves the construction of such approaches as will not interfere with city travel. It is announced that the financial scheme is to issue $3,500,000 of stock and a like amount of 5 per cent. bonds. A Philadelphia syndicate takes 49 per cent. of the stock and all the bonds at par, and the Reading takes and pays cash for the remaining stock.

The Switchmen's Strike at Chicago.

The strike of the yardmen at Chicago has spread during the week to a number of other roads, and has been characterized by lawlessness similar to that in the strike of two years ago. The switchmen throughout the city have seemed determined to do anything in their power that promised to aid the strikers on the Burlington, but their behavior, whether lawful or riotous, has seemed to be governed by no concerted plan, and indecision has characterized all parties. The submissive policy of the superintendents and yardmasters of most of the roads has patched up affairs and kept the difficulties from coming to a crisis. But little freight for or from the Burlington has been offered, and the officials have handled it personally, thus averting trouble for the time. The engineers and firemen of the switching engines seem in most cases to have sympathized with the conductors and brakemen, and have generally struck with them. Mr. Arthur states that the Brotherhood has no connection with the present strikes and acknowledges no responsibility for them. As we go to press the more sensible element among the strikers seems to have gained control, and the violence and lawbreaking promises to cease.

On Thursday of last week a mob of strikers turned a switch in the Chicago & Northwestern yard and ditched several cars that a Burlington engine was attempting to move; and the trainmen, including Superintendent Besler, of the Burlington, who was on the train, were beaten and stoned. One man who assaulted the engineer was arrested. The city police and the Pinkerton detectives were soon on the scene and dispersed the rioters. The man arrested had been an employé of the Chicago, Milwaukee & St. Paul, and 120 of that road's yardmen struck on hearing of the arrest, but went back to work the same night. On Thursday additional reports were received of strikes of yardmen at other points on the Burlington road, and there was some violence at Creston. At St. Joseph a yardman was killed in trying to jump upon an engine; the yardmen thereupon immediately quit work, although it is said that there was no fault upon the part of the engineer. Every train moved by the Burlington road in Chicago is accompanied by a strong guard of police or Pinkerton men, but the protection afforded is inadequate, as coupling pins, stones, etc., are frequently thrown, and several men on the trains have been injured by them. Some Burlington trains were stoned in the Union Stock Yards on Friday morning, and a fireman was knocked senseless. Business there proceeded as usual, however, during the remainder of the day. On that day the strike in the Chicago, Milwaukee & St. Paul yards was renewed and some engine dispatchers and hostlers also struck, so that the suburban passenger traffic was crippled. The Chicago & Northwestern and the Chicago, Rock Island & Pacific apparently supported their yard employés in boycotting Burlington cars.

On Saturday the Chicago, Milwaukee & St. Paul yards were almost entirely deserted, and a number of road trainmen, both freight and passenger, also struck. The yardmen on the Chicago, St. Louis & Pittsburgh threatened to stop work, but after some parley went on with their duties. Six crews left their engines in the yard of the Pittsburgh, Fort Wayne & Chicago.

Several squads of men to take the places of switchmen have arrived at Chicago from the east, some having come from New York and Massachusetts, though most of them are from the Philadelphia & Reading road. One party was interfered with by strikers' sympathizers at Lima, Ohio.

On Monday the Michigan Central, Lake Shore, Pittsburgh, Fort Wayne & Chicago, Belt Line, Chicago, St. Louis & Pittsburgh, and Chicago & Atlantic roads informed the Burlington that they were ready to receive freight as offered. The Chicago, Milwaukee & St. Paul told its men to return to work or be blacklisted. A passenger train of this road was derailed by a maliciously misplaced switch in the night, and violent treatment of individuals was reported in several places. A night watchman in the Chicago & Alton was shot and killed, but it is believed to have been the work of tramps whom he had driven from a train.

On Tuesday the Michigan Central yardmen struck and tried to get the road to boycott Burlington freight, but the officers were firm and the strikers yielded. On Tuesday evening there was "a mass-meeting of 1500 railroad employés held with closed doors," at which it is stated that the men of all the roads came to an agreement to resume work on all the roads except the Burlington. This result is said to be due to the exertions of Chief Arthur, Grand Master Sargent, Grand Master Monaghan of the Switchmen's Association, Mayor Roche, and Mark Crawford, who also represents the switchmen. The statement that Mr. Arthur had any influence is, however, denied. The mass meeting was addressed by General Manager Jeffery of the Illinois Central, who spoke two hours.

The men hope now to crowd the Burlington with freight and cars and compel it to acknowledge that its force is insufficient and incapable. The Chicago, Milwaukee & St. Paul and the Pittsburgh, Fort Wayne & Chicago agreed to take back all of their striking employés, and these two roads, whose freight and local passenger business seems to have been almost wholly suspended for several days, resumed regular traffic on Wednesday. On that day the Rock Island delivered the first train to the Burlington since the beginning of the strike. A dispatch to the New York *Evening Post* says that the sudden weakening of the strikers is owing to the action of prominent Chicago merchants who warned the leaders that legal measures, under the Conspiracy Act, would be taken. The lumber merchants, who have been among the worst sufferers, had resolved to institute suits against the boycotting roads.

Mr. Arthur has gone to his home at Cleveland. The brotherhood enginemen at Chicago have notified the Illinois Railroad Commission that they will bring before it a complaint, with evidence, of incompetence of enginemen now employed by the Chicago, Burlington & Quincy. At Aurora, Ill., where the population is largely made up of Burlington employés, public opinion supports the officers of the law, and two switchmen who threw stones at engines are under $500 bonds each. Brotherhood engineers and firemen on the Ohio, Indiana & Western at Springfield, Ohio, notified the general manager that they would strike unless the road refused C., B. & Q. cars.

The paint shop of the Burlington road at Aurora was burned on the night of the 29th, and 100 of the new engineers and firemen, who were sleeping in the building, had barely time to grasp their clothes and escape. Several of them were assaulted by unknown parties as they rushed out to seek shelter. It was positively asserted that the fire was incendiary, having broken out at two or three places at once, but another account states that it started from a broken lamp. A passenger car was burned in the night at Downer's Grove, and the fire is believed to have been incendiary. The burning of the paint shop throws over 100 men out of employment, and General Manager Stone ordered that this be taken as the occasion for reducing the force at Aurora, no move being made towards rebuilding the shops.

The Chicago, Burlington & Quincy has filed in court a denial of each of the charges made by the Chicago, Rock Island & Pacific in its recent answer to the Burlington's suit, declaring them all wilfully false and malicious. The statement concludes:

"No notice has been given complainant (the Chicago, Burlington & Quincy) that the engineers and firemen of defendant had given up control of its traffic department or granted permission to the defendant to conduct its business as a public carrier according to law, or that the defendant's policy of absolute non-intercourse as declared in the orders and letters of its agents was in any respect altered."

The Rock Island rejoins with a reiteration of its statements and asks for the appointment of a master, claiming to be able by cross-examination to disprove General Manager Stone's statement.

English Railroad Working.

The following is an abstract of a lecture delivered by Mr. George Findlay, General Manager of the London & Northwestern (England), at the School of Military Engineering, Chatham. The lecturer referred chiefly to the methods in use on his own line:

The immense and continuous development of railway traffic during the last fifty years had taxed to the utmost the ability and inventive genius of those engaged in its management, and of constructive and mechanical engineers, in order to keep pace with it, and to admit of its being conducted with regularity and dispatch, and with a minimum of delays and mishaps. The traffic consisted of varying elements. There are express and mail passenger trains running at a speed of 45 miles an hour, and even more in some cases; others at a somewhat less speed; stopping trains, calling at every station, and running at a rate of from 20 to 25 miles an hour; local suburban trains, running for short distances at a fairly high rate of speed, chiefly for residential purposes; express freight trains between the larger towns, attaining a speed of 20 or 25 miles an hour; slow, stopping freight trains, for serving smaller towns and villages; and finally, the heavy coal trains running out of the great colliery districts to every centre of population. All these various trains, heavy and light, fast and slow, some stopping at the stations, and others dashing through them at high rates of speed, have to be accommodated to a great extent upon the same line of rails, yet all must keep time and fulfill their appointed functions—and briefly, this is the great problem which railway management has to solve.

* This figure for repairs includes 0.54 cent per mile for new engines built.

Such a service cannot be carried on under all circumstances —whether by night or day, in fogs, in snow-storms, in wind or rain, and under all other adverse conditions—without entailing hardships and dangers upon the men engaged in the working; but it was pleasing to state that the great army of men of all grades in the employment of the London & Northwestern show at all times a state of complete discipline and cheerful devotion to duty which could not be exceeded by any body of men whatever, and which, although perhaps not so well understood or appreciated by the public as might be the case, reflect the highest credit upon them.

On June 30, 1887, the mileage maintained was 1,754, and the mileage owned, partly owned, leased, rented or worked, was 1,838½, while 15¼ miles were under construction. The company also exercised "running powers" over 535¾ miles of foreign (rival) lines, and the total mileage ran over by their engines was 2,549⅜ miles of road. It is considered in England that the length of a railway is that over which it collects the entire receipts, and in this case, as given above, the length is 1,838½ miles. Where two or more companies jointly own a line, each is credited with its share of the length.

The number of engines was 2,541; carriages, 4,548; other vehicles used in passenger trains, 2,051; freight and coal wagons, 53,555; and nearly 3,000 carts and lorries and 3,000 horses. The train mileage during the year ended June 30, 1887, was, passenger, 19,533,957 miles; goods and mineral, 18,158,107, a total of 37,692,064 miles. In other words the engines ran nearly a mile and three-quarters every second, or 104 miles every minute, and practically they put a girdle round the earth every four hours. During the year the number of passengers was 56,465,260, not including the journies of holders of commutation or season tickets. The number of tons of goods and minerals carried was 33,927,758. The revenue derived from all sources was, from passenger traffic, £4,185,818; goods traffic, £5,974,319; or a total of £19,160,137.

To carry on this great traffic the main essentials are a sound permanent way, powerful and efficient engines, an ample supply of suitable rolling stock, the most perfect signaling and telegraph arrangements, especially the block telegraph system, continuous brakes, and last but not least, a highly trained and thoroughly qualified staff, in order to obtain which the company began by appointing lads of fourteen as boy porters, telegraph clerks and to other similar employments, and when these lads grew up to be men they were experienced in the various branches of employment, and were able to fill such posts as became vacant. To the training of signalmen the most scrupulous attention was paid, and their appointments were never confirmed until after a thorough examination—especially in the matter of color blindness—they were found to be fit for the posts they had to fill. Guards of passenger trains were selected from the porters, and guards of goods trains (freight conductors) from the goods porters and shunters (yard and switchmen) always after a rigid examination and with due regard to general intelligence, capacity, and character. For the superior positions of inspectors, foremen, station masters, and the higher grades of the service, it was the invariable rule to select men from the lower ranks solely on the ground of merit, irrespectively of seniority or any other circumstances. Thus it was no unusual thing for a station master, by reason of special aptitude, to rise to the position of divisional superintendent, and even general manager. The company were not unmindful of the material welfare of the men they employed, and three insurance funds had been established in connection with the company, by means of which the men were provided for in the event of sickness, accident, or old age. The total number of the staff was 55,217.

In order to explain how the engine working was arranged, the time and speed of running, and the intersections of the trains at places where goods and slow trains had to shunt into sidings for the fast trains to pass them, the lecturer exhibited a section of the line between Preston and Carlisle. If the theory of the time bill could be realized absolutely in practice, it would represent the perfection of railway travelling, but owing to bad weather (especially fog and snow-storms), to the fluctuations of traffic and other uncontrollable causes, this ideal could never be kept up. When the calculations of the time table were upset arrangements had to be left to the discretion of the station masters and the foremen. The most that could be done on the part of the management was to lay down certain rules and principles for the guidance of the men. Fogs upset the arrangements and caused anxiety more than all other elements of difficulty put together. The fog of the week ended Jan. 14 was the most severe visitation remembered. Delays were inevitable, but with the exception of one or two trifling mishaps, the traffic, owing to the precautions taken, was carried on during the week without any actual interruption, and without accident or injury to a single passenger.

In the last twenty years trains had more than doubled in weight, and the speed had increased in some cases as much as 14 per cent. In consequence new engines had to be constructed capable of dealing with greater weight and speed. The engines now employed were of eight distinct types. The old express passenger engines with a single pair of driving wheels were being superseded by the compound engines invented by Mr. Webb. The engine Dreadnought had run a train weighing 721,000 lbs. at a speed of 44 miles an hour, including stoppages, with an expenditure of 41.6 lbs. of coal per mile. Of course with such rates of speed it was necessary to have powerful and trustworthy brakes for bringing the trains to a stand quickly when required. The brake gear used on the company's line was of two kinds, the vacuum and the Westinghouse.

The question of safety then led the lecturer to deal with the system of signaling and telegraphing the trains, and the ingenious devices employed for securing gates at level crossings, turn tables and canal bridges. The signaling of the London & Northwestern Railway had, he said, involved the erection of 1,400 signal cabins containing 30,000 levers, operating over 4,000 sets of switches in connection with passenger lines and 14,000 signals by means of rods, having an aggregate length of 1,000 miles and wires that would reach from Liverpool to New York. The aggregate cost of the signaling system had been $10,000,000, or about $5,500 per mile. Electricity also was a great factor in the working of railways, and the total number of bells used in the block telegraph as an auxiliary to the working of the out-door semaphore signals was 4,850. As to ordinary message telegraphs, the number transmitted over the company's wires during the year was 14,573,607, showing an increase of 60 per cent. during the last decade. The mileage of wire on the system was 18,115 miles, and over 100,000 circuits were in work.

Economy of the Non-condensing Engine.

At the ordinary meeting of the Institute of Civil Engineers on Tuesday, the 13th of March, the President, Mr. Bruce, being in the chair, the paper read was on "Economy Trials of a Non-condensing Steam Engine—Simple, Compound, and Triple," by Mr. P. W. Willans, M.Inst.C.E.

The author described a series of economy trials, non-condensing, made with one of his "central-valve" triple-expansion engines, with one crank, having three cylinders in line. By removing one or both of the upper pistons the engine could be easily changed into a compound or into a simple engine at pleasure. Distinct groups of trials were thus carried out under conditions very favorable to a satisfactory comparison of results. No jackets were used, and no addition had, therefore, to be made to the figures given for feed-water consumption on that account. Most of the trials were conducted by the author, but check-trials were made by Mr. MacFarland Gray, Professor Kennedy, Mr. Druitt Halpin, Professor Unwin and Mr. Wilson Hartnell. The work theoretically due from a given quantity of steam at given pressure, exhausting into the atmosphere, was first considered. By a formula reduced from a diagram of Mr. MacFarlane Gray, which agreed in results with the less simple formulas of Rankine and Clausius, the pounds weight of steam of various pressures required theoretically indicated H. P. hour were ascertained. (See table below.)

A description was then given of the main series of trials, all at 400 revolutions per minute, of the appliances used, and of the means taken to insure accuracy. A few of the results were embodied in the following table. The missing quantity of feed-water at cut-off, which, in the simple trials, rose from 11.7 per cent. at 40 lbs. absolute pressure to nearly 30 per cent. at 110 lbs., and at 90 lbs. was 24.8 per cent., was at 90 lbs. only 5 per cent. in the compound trials. In the latter, at 160 lbs., it increased to 17 per cent.; but on repeating the trial with triple expansion, it fell to 5 46 per cent., or to 4.43 per cent. in another trial not included in the table. On the other hand, from the greater loss in passages, etc., the compound engine must always give a smaller diagram, considered with reference to the steam present at cut-off, than a simple engine, and a triple a smaller diagram than a compound engine. Nevertheless, even at 80 lbs. absolute pressure the compound engine had considerable advantage, not only from lessened initial condensation, but from smaller loss from clearances, and from reducing both the amount of leakage and the loss resulting from it. These gains became more apparent with increasing wear. The greater surface in a compound engine had not the injurious effect sometimes attributed to it, and the author showed how much less the theoretical diagram was reduced, by the two small areas taken out of it, in a compound engine than by the single large area abstracted in a simple engine.

The trials completely confirmed the view that the compound engine owed its superiority to reduced range of temperature. At the unavoidably restricted pressures of the triple trials, the losses due to the new set of passages, etc., almost neutralized the saving in initial condensation; but with increased pressure, say 200 lbs. absolute, there would evidently be considerable economy. The figures of these trials showed that the loss of pressure due to passages was far greater with high than with low-pressure steam, and that pipes and passages should be proportioned with reference to the weight of steam passing and not for a particular velocity merely.

The author described a series of calorimetric tests upon a large scale (usually with over two tons of water), the results of which were stated to be very consistent. After comparing the rates of initial condensation in cases where the density of steam, the area of exposed surface, and the range of temperature were all variables, with other cases (1) where the density was constant, and (2) where the surface was constant, the author concluded that, at 400 revolutions per minute, the amount of initial condensation depended chiefly on the range of temperature in the cylinder, and not upon the density of the steam or upon the extent of surface: and that its cause was probably the alternate heating and cooling of a small body of water retained in the cylinder. The effect of water, intentionally introduced into the air-cushion cylinder, corroborated the author's views, and he showed how small a quantity of water retained in the cylinder would account for the effects observed. At lower speeds surface might have more influence.

The favorable economical effect of high rotative speed, *per se*, was very apparent. In a trial with a compound engine, with 130 lbs. absolute pressure, the missing quantity at cut-off rose from 11.7 per cent. at 405 revolutions to 29.66 per cent. at 130 revolutions, the consumption of feed-water increasing from 20.35 lbs. to 23.67 lbs. This saving of 14 per cent. was due solely to increase of speed. Similar trials had been made with a simple engine. In one simple trial at slow speed the missing quantity rose to 44.5 per cent. of the whole feed-water.

The author compared a series of compound trials, at different powers, with 130 lbs. absolute pressure and various ratios of expansion with a series giving approximately the same powers at a constant ratio of expansion, but with varying pressures, being practically a trial of automatic expansion against throttling. Starting with 40 indicated H. P., 130 lbs. absolute pressure, four expansions and a consumption of 20.75 lbs. of water, the plan of varying the expansion, as compared with throttling, showed a gain of about 7 per cent. at 30 indicated H. P., but of a very small percentage when below half-power. If the engine had an ordinary slide-valve, the greater friction, added to irregular motion, would probably neutralize the saving, while if the engine were one in which initial condensation assumed more usual proportions, the gain would be probably on the side of variable pressure. Even as it was, the diagrams showed that the missing quantity became enormously large as the expansion increased. Judging only by the feed-water accounted for by the indicator, the automatic engine appeared greatly the more economical; but actual measurement of the feed-water disproved this. The position of the automatic engine was, however, relatively more favorable when simple than when compound.

In conclusion the author referred to a trial with a condensing engine, at 170 lbs. absolute pressure, in which the feed-water used was 15.1 lbs., a result evidently capable of further improvement, and to an efficiency trial of a combined central-valve engine and Siemens' dynamo, made for the Admiralty at various powers. At the highest power the ratio of external electrical H. P. to indicate H. P. in the engine was 82.3 per cent. Taking the thermo-dynamic efficiency of the engine at 80 per cent., that of the combined apparatus would be nearly 66 per cent.

Intended mean admission pressure.....lb.	40	90		110		130	150		160		170
	S.	S.	C.	S.	C.	C.	C.	T.	C.	T.	T.
Simple, compound or triple. Actual mean admission-pressure.....lb.	40.88	92.65	87.54	106.3	109.3	130.6	149.9	151.9	158.5	158.1	172.5
Percentage ratio of actual mean pressure, referred to L.-P. piston, to theoretical mean pressure.....	98.2	100	91.3	100.7	94.8	94.2	94 6	84.54	95.9	85.3	85.2
Indicated horse-power.....	16.51	31.61	29.14	33 5	33.0	36.31	38.59	35.69	39.55	35 56	38.45
Feed-water actually used per indicated H. P.-hour:											
Simple.....lb.	42.76	26.89	.....	26.0	.....	.....	.....	.....	.....	.....	.....
Compound..... "	.....	.....	24.16	.....	21 37	20.35	19.45	.....	19.19	.....	.....
Triple..... "	.....	.....	.....	.....	.....	.....	.....	19.68	.....	19.19	18.45
Steam required theoretically per indicated H. P.-hour. "	34.6	19.24	19.86	17.9	17.65	16 25	15.23	15.16	14.87	14.9	14.36
Percentage of efficiency.....	81.1	71.5	82.2	68.9	82.5	80.0	78.3	77.0	77 4	77.6	77.8
Percentage of feed-water missing at cut-off in H. H.-P. cylinder.....	.....	.....	.....	.....	.....	.....	.....	5.33	.....	6.84	5 01
Ditto H.-P. cylinder.....	.....	.....	5.0	.....	9 5	11 7	15.1	14.84	17.0	12.06	15.33
Ditto L.-P. cylinder.....	11.7	24.8	15.2	29.56	16.15	19.1	20.6	22.12	21.3	22.11	24.21
Percentage of feed-water missing at end of stroke in L.-P. cylinder.....	10.4	18.83	14.25	21 53	16.59	17 55	20 69	18 01	19.55	18.81	19.25

TECHNICAL.

Locomotive Building.

The Schenectady Locomotive Works have turned out during the month of March 26 locomotives, as follows: Three 20 by 26 63-ton 12-wheel engines for the Beech Creek R. R.; one 20 by 24 58 ton Consolidation for the Fall Brook Coal Co.; eight 18 by 24 48-ton 10-wheelers for the Southern Pacific; four 18 by 24 48-ton passenger engines for the Atchison, Topeka & Santa Fe; ten 17 by 24 6-wheel switching engines for the Chicago & Northwestern. This establishment is now turning out one complete locomotive each working day.

The Brooks Locomotive Works, Dunkirk, N. Y., has contracted with the Cleveland and Canton for the building of eight 50-ton Mogul standard gauge locomotives, to cost $9,475 each; seven passenger locomotives to cost $8,875 each and three switching locomotives to cost $8,275 each, to be delivered July 1, or earlier.

Messrs. H. K. Porter & Co., of Pittsburgh, Pa., has lately shipped a small locomotive to the United States Government for improving the Columbia River in Oregon. The firm is also building a number of coke-oven and furnace locomotives for Southern companies, and logging locomotives for Louisiana. A 20-in. gauge locomotive is under construction for a company in Arizona.

Car Notes.

A company has been reorganized in Chicago for the purpose of building and operating cars designed for the shipment of live poultry. The cars have five decks, with twenty compartments in which live fowls are packed. The cars have open net-work sides, with storm curtains to be used when needed. It is stated that W. S. Weed, General Freight Agent of the Toledo, St. Louis & Kansas City, will take a leading part in this enterprise.

The Harlan & Hollingsworth Co., Wilmington, Del., have just delivered the following orders for cars: To the Baltimore & Ohio, 15 sleeping, five parlor and five passenger; to the Mexican Central, four passenger and four eight wheel caboose cars; to the San Francisco & North Pacific, five passenger; to the Lackawanna & Pittsburgh, one passenger and one baggage. They have also under construction three sleeping cars for the Boston & Albany, and four for the New York, New Haven & Hartford.

The Peninsular Car Works, Detroit, Mich., have a contract for 400 25 ton gondola cars.

Bridge Notes.

The contract for the New London bridge of the New York, Providence & Boston has been let to the Union Bridge Co. The contract includes foundations and superstructure.

It is reported that the County Commissioners will build an iron bridge over Salem Creek, in Forsyth County. Address, for details, E. A. Conrad, Winston, N. C.

The Board of Freeholders will erect a bridge over Cape Island Creek between Cape May City, N. J., and West Cape May.

An iron bridge is to be built by the County Commissioners at Hersey, Mich.

The County Commissioners have decided to place a bridge over the Muskegon River at Big Rapids, Mich.

A bridge will be built across the Willamette at Oregon City, Or., by the County of Clackamas.

It is stated that the Pennsylvania will replace 94 wooden bridges on the Southwestern branch by iron structures.

The Chicago, Milwaukee & St. Paul will build 4 viaducts over Kinzie street, Chicago, Ill.

The City Engineer of Indianapolis has been directed to make estimates of the cost of a bridge across Pleasant Run on Raymond street.

The Lynchburg & Durham will build a bridge over Staunton River, and about 20 miles of trestle work. J. W. Goodwin, Lynchburg, Va., is Chief Engineer.

The contract to build four iron bridges at La Grange, Tex., has been let to the Missouri Valley Bridge Co., and the contract to build two iron bridges to the King Iron Bridge Co., of Cleveland, O.

The Niagara Bridge Works, of Buffalo, N. Y., have assigned.

Manufacturing and Business.

The Industrial Works, of Bay City, Mich., report business active, and have under way in their shops, with other machinery, two steam excavators and three pile drivers. They have recently shipped to the Chicago, Rock Island & Pacific four heavy combination turn-tables, and also a double 15-ton wrecking and construction crane. They have just shipped the West Shore one of their improved extension steam pile drivers, and have one ready to ship to the Panama road for work at Aspinwall. These drivers are for use in new construction and repair work, and are adapted to the ordinary requirements of pile driving.

Riehle Bros., Philadelphia, report the following orders among many others of their regular line of scales, trucks, etc.: Farrell Foundry & Machine Co., Ansonia, Conn., 50,000-lb. Vanderbilt T. M.; Atkinson Spring Works, Chicago, Ill., 50,000-lb. spring-tester; Decatur Car Wheel Co., Decatur, Ala., one 5,000-lb. transverse T. M.; Cramp & Sons, Philadelphia, Pa., one 6,000-lb. R. M. scale; Oregon Iron & Steel Co., Portland, Oregon, two rolling mill scales, one rope twister, one pipe testing machine.

The Toledo Foundry & Machine Co. has contracted with the Pennsylvania for a second Victor excavator with a capacity of eight yards per minute. The firm has sold one of its pirless turn-tables to the Mobile & Ohio for the Mobile terminus, and has an order from Germany for one of Stock's patent railroad velocipedes.

Robinson & Orr, of Pittsburgh, Pa., have removed their offices to the Hamilton Building.

W. G. Coolidge & Co., of Chicago, Ill., engineers and contractors, designers and builders of bridges, building and substructures, have removed their office to the Phœnix Building, 138 Jackson street, Chicago.

Mr. J. S. Casement, the railroad contractor of Painesville,

O., has closed a contract with the city of Cleveland, O., for a tunnel 9,200 ft. long, with a diameter of 7 ft. by 7 ft. 2 in. Work is to be commenced immediately, and it is to be completed in two years. The contract price is $204,000. Eight bids, running from $204,000 to $240,000 were received.

Lloyd, Booth & Co., proprietors of the Falcon Foundry & Machine Works, Youngstown, Ohio, who were lately incorporated as the Lloyd-Booth Co., are now working on a contract comprising some 60 tons of rolls and rolling mill machinery for shipment to Birmingham, Ala., and a 20-in. mill for the Warren Rolling Mill, at Warren, Ohio. A new machine shop will soon be erected, and the company will give special attention to rolling mill machinery.

The Heine Safety Boiler Co. has sold the Risdon Locomotive Works, San Francisco, Cal., a 110 horse-power Heine boiler.

The Union Indurated Fibre Co. has established an office in Boston at 46 Federal street, to handle its increasing business. Theodore Pinkham has been appointed manager. The general offices in New York will be removed to 37 Barclay street, May 1. The Philadelphia office has been removed to 58 W. 2d street, and the Chicago office has been removed to 45 Wabash avenue.

Iron and Steel.

The charcoal blast furnace of the Ashland Iron & Steel Co. now in course of erection at Ashland, Wis., is expected to begin operations next week.

Wm. Swindell & Bros. have contracted to build a gas heating furnace for Oliver Bros. & Phillips which will make the fifth put in the establishment. They will also build crucible steel-melting furnaces in the Henry Disston Saw Works at Philadelphia, which will increase its steel-producing capacity 60 per cent.

The Pottsville Iron & Steel Co. of Pottsville, Pa., has ordered drawings from Smith & Laughlin, metallurgical engineers of Pittsburg, Pa., for a double regenerative gas furnace, to be used for heating extra large sizes of channel bar and I beams.

The furnaces at the Iowa Rolling Mill, Burlington, are being replaced with Smith furnaces. The change will soon be complete and the new fires be lit.

The Laclede Plate Mill Co., St. Louis, Mo., has 16 puddling furnaces and a scrap and slab furnace operating.

No. 3 Furnace of the Chestnut Hill Iron Ore Co., at Columbia, Pa., was blown out last month.

The Lookout Rolling Mill is now turning out angle plates for the Chattanooga, Rome & Columbus. The mill is employing 300 men, with an output of 30 tons of finished iron per day.

It is stated that the plant of the Indianapolis Rolling Mill Co., at Indianapolis, Ind., will be converted from a steel mill into a rolling mill for the manufacture of heavy iron structural work.

The Pittsburgh Tube Works, at Pittsburgh, have been closed for an indefinite period on account of the dullness and low prices.

The works of the Leechberg Machine & Foundry Co., at Leechberg, Pa., were destroyed by fire from escaping natural gas, March 29. The loss is estimated at about $50,000, partly insured.

Valve Setting Apparatus.

Mr. R. C. White, foreman of the Birmingham shops of the Louisville & Nashville, has invented a portable apparatus for setting valves without moving the locomotive.

Mitis Castings.

The Mitis process of making small castings of wrought iron is now in operation at the works of the Eureka Cast Steel Co., Chester, Pa. As it is well known the metal used in the Mitis process is rendered fusible by the addition of a minute quantity of aluminium. The hot metal is very fluid, and the castings produced are very sharp and can be bent and welded, and closely resemble wrought-iron. The crucibles used are heated by oil gas.

THE SCRAP HEAP.

Industrial Progress in the South.

The industrial development of the South is as yet meeting with no setback. The *Manufacturers' Record* in an article entitled "Three Months' Progress" returns the number of new enterprises reported for the first three months of this year as 1,075, against 923 for the corresponding period of last year. There are reductions in the blast furnaces, gas works, ice factories, brick works and miscellaneous iron works. An increase in machine shops, cotton mills, water works, carriage works, electric light works, lumber mills and canning factories. The capital stock and bonds represented by these new enterprises is 38½ million dollars, Texas leading with 6½ millions, Kentucky and Alabama following with 5½ and 4 million dollars.

Politics in Railroading.

Last month's experience warrants us in saying that New England requires protection from blizzards and free trade in snow-plows.—*Pathfinder.*

First of the Season.

The orchestras on the palatial Fall River Line steamers are once more agitating the evening air with rythmical waves of harmony.—*Pathfinder Poet.* If, now, the steamers could be vestibuled the passengers' felicity would be complete.

W. K. Vanderbilt's New Private Car.

A new private car for the use of William K. Vanderbilt has just been completed at the East Buffalo shops of the Wagner Palace Car Company. At the rear is the observation room, about 8 ft. square, with two large plate glass windows. The apartment is furnished in antique oak, richly carved, and the upholstery is in dark blue embossed plush. The ceilings are painted in dark rich colors and the transom lights are of clouded glass. The sofa in this room can be converted into a berth. Beyond this are two staterooms with folding upper and lower berths. The woodwork of one is oak, the other mahogany, and the washstands, etc., are of Tennessee marble with silver fittings. Beyond these again are two larger staterooms, each containing a stationary bed, with washstand, etc. One of these rooms is furnished in oak and the other in mahogany. Between the two pairs of rooms is a Baker heater. Beyond is the saloon, furnished in mahogany and blue embossed plush. The curtains of the windows are of silk and satin. At one end is a sofa which can be converted into a berth, at the other a carved cabinet at the side of which a door leads to a wash and bath-room. Adjoining this on the other side beyond the saloon are the porter's berth and closets for linen, etc. In the next compartment is the commissary, with lockers and refrigerators and cupboards for all sorts of supplies. A large window opens through a partition into the kitchen, furnished with a range on which "you" can cook anything from an egg to an elephant, the latter, roasted whole, being the favorite dish of the owner of the car. The series of transoms through the car can be lowered, to permit a draught the whole length. The car is lighted throughout by handsome brass lamps, the glass in the doorways is all of heavy beveled plate, and the woodwork is carved without regard to cost. The length of the car over all is 75 ft., and it cost $25,000.—*Exchange.*

After-Dinner Speeches.

"My good man," said the worthy lady who had given the tramp a large plateful of victuals, "pardon me for making the suggestion, but would you not enjoy your repast fully as well, if not better, if you should follow the custom that has always prevailed in this household and invoke a blessing on your food before you begin?"

"Madam," replied the hungry tourist, with his mouth full, "me and Chauncey Depew always does our best talkin' after we've ett."—*Chicago Tribune.*

Railroads in Portugal.

The total railroad mileage of Portugal at the end of October, 1887, was 1,125 miles. Of these 455 miles were state railroads, the remainder being owned and operated by three private companies, the most important of which, the Royal, operates 475 miles.

The Work of a Railroad Lawyer.

The following report of A. A. Hurd, the Solicitor of the Atchison, Topeka & Santa Fe for Kansas, made to Hon. George R. Peck, the General Solicitor of the company, will convey some idea of the amount of labor which devolves upon the legal department of a railroad. The statement is for the year 1887, and includes only the work done in the state of Kansas. It covers the business of 2,655 miles of road, extending through 68 countries. Of the 987 cases pending against the road at the beginning of the year and instituted since, 460 have been settled. The total amount claimed was about $2,700,000, and the total of the cases settled was over $1,000,000; but the amount recovered by claimants was only $188,787. Of suits brought by the company there were only 28 during the year, which, with the 28 pending Jan. 1, involved $164,235. Twenty-three of these, claiming $132,837, were settled, the road recovering $132,447.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulations of Railroads.

In Missouri a deed by a railroad company conveyed "all right, title, interest and estate of the grantor in all and singular the entire line of the P. R. R. * * * together with all and singular the hereditaments and appurtenances thereunto belonging," etc. The Supreme Court holds that this description, without more, is sufficient to convey a lot of ground contiguous to the line of way of the grantor and belonging to it.[1]

In the same state it is held that the act of Congress of June 10, 1852, granting certain public lands in Missouri to the state for the purpose of aiding in the construction of the Hannibal & St. Joseph Railroad, passed the title to the state *in præsenti*, although such title was not perfected until the definite location of the road; and a subsequent entry of a portion of such lands in the public land office, and the grant of a patent thereto, were invalid.[2]

In Tennessee the Supreme Court rules that under the charter of a railroad exempting from taxation the road, its franchises, warehouses, etc., an elevator situated some distance from the road, necessary for and used as a warehouse, and so much land as is occupied by it, and so much land as is necessary for spurs and side tracks connecting the elevator with the railroad, are exempt, the elevator being located at such distance on account of natural disadvantages.[3]

In Pennsylvania the Supreme Court holds that where the charter of a railroad company provided that the company should reconstruct, on the most favorable location, any public road whose site it should find it necessary to change, and the railroad appropriated a public road lying between its own road and a river, by constructing upon it a retaining wall of stone, and the public was thereby obstructed from the proper use of the road, the company, or its lessees, is liable on an indictment for maintaining a nuisance.[4]

In Missouri the Supreme Court decides that under the Act of March, 1875, railroads must be taxed at the same rate as individuals; that a county court cannot levy taxes on railroad property to pay interest on railroad bonds, except according to the provisions of Rev. St. Mo. § 6799, requiring an order from the circuit court authorizing the levy, made upon proper application; that Rev. St. Mo. § 6880, regulating the levying of taxes on railroad property by ascertaining from the returns in the office of the county clerk the average rate levied for school purposes by the local boards, and charging to the railroad taxes at such average rate on the proportionate value of the railroad property certified to the clerk by the state, is not in conflict with article 10, § 11 of the state constitution, limiting the rate of taxation for school purposes, or with the fourteenth amendment to the Constitution of the United States; and that where the levy for taxes by the county court on the property of defendant railroad was illegal, because made at a different rate from that applied to the property of individuals, but such taxes were paid, such payment should be allowed defendant as a credit in an action against it under a new levy made on its property under a later act.[5]

In the same state it is held that in an action against a railroad to recover taxes due therefrom, where payment was refused on the ground that the county court took as the basis of their levy the value of the property on Aug. 1, 1874, instead of Aug. 1, 1875, as required by law, the taxes cannot be sustained by showing that the tax receipts designated the taxes as for the year 1875, instead of 1876, as designated in the receipts of other taxpayers.[7]

In Oregon it is ruled that it is no defense to an action against a railroad company for waste, committed on premises while in its possession under a lease, that at the time the waste was committed the railroad was in the hands of a receiver.[8]

In Kansas, the Supreme Court decides that where a railroad company contracts with a construction company to survey and locate its line, procure its right of way, build its road-bed, tracks, bridges, side tracks, etc., and equip the same with engines and cars, in accordance with certain specifications, such provisions of the construction contract make the construction company an independent contractor, in the sense that the railroad company is not liable for injuries occasioned by a defective track, or the negligence of employés on a train laden with construction materials, on a part of the line constructed by the construction company, and remaining under its control, and not inspected and accepted, or operated by the railroad company.[9]

In the same state the Supreme Court holds that where a board of county commissioners is authorized by a favorable vote of the electors of a township to subscribe on behalf of said township to the capital stock of a railroad company, in the full amount that the township is authorized by law to subscribe, that proposes to build its line through said township, on the terms and conditions prescribed in the vote, and a subscription is duly made and accepted in writing by the railroad company, the subscription and its acceptance creates a contract binding on the township, and, when the railroad company performs all the terms and conditions, it is entitled to the bonds of the township in preference to another railroad to whose capital stock a subsequent subscription was made, but that first complied with the terms and conditions of such subsequent subscription.

The proviso contained in section 1 of the act to enable counties, townships and cities to aid in the construction of railroads, etc. (Comp. Laws, 1885), is a limitation on the amount to be subscribed by a township to aid in the construction of railroads, whether extended to one or to several railroad companies. It prescribes a limit as to the amount of bonds to be issued, beyond which the commissioners cannot go for any purpose. Up to this limit aid may be voted to one railroad company, or it may be divided among several, but the sum of $15,000 and five per cent. additional of the assessed value of the property of the township is all that can be legally voted and issued under any circumstances.[9]

Carriers of Goods and Injuries to Property.

In Missouri the Supreme Court rules that a shipper against whom judgment has been rendered for failure to deliver goods as agreed, by an assignment of the bill of lading, cannot maintain an action on such judgment against the carrier who had issued the bill of lading, although the carrier was notified of the pendency of the action, and requested to defend, since the latter could not, had it been a party to the action, have set up the defenses available as against the shipper.[10]

In Texas a piece of machinery was delivered to an express company in Texas for shipment to Baltimore. The contract of shipment provided that "the said company should not be held liable for any claim arising from the contract, unless it be presented within 60 days of the date of the contract." The Supreme Court holds that though the claim was not presented as required, the plaintiff's right of recovery for delay in shipment was not barred, the restriction for presentment of claim without reference to the time of loss being unreasonable. The Court also rules that the jury in estimating the plaintiffs' damages may consider the loss of time, the expense of idle hands, the contracts which the plaintiffs had to fill, and the profits arising from the operation of the mill, and, multiplying the amount of loss per day by the number of days, Sunday excepted, will give the amount plaintiffs are entitled to recover.[11]

In Tennessee, in a very exhaustive and able opinion, Judge Caldwell, of the Supreme Court of that state, decides that an express or transportation company cannot relieve itself from liability for loss of goods in its hands by a stipulation in the bill of lading that in case of loss the railroad in whose custody the goods at the time are, shall be responsible.[12]

In Pennsylvania it is held that where goods are attached in the hands of a common carrier previous to a notice of stoppage *in transitu*, the carrier, after he has notified the owner, is not responsible if the goods are sold under the attachment proceedings.[13]

In Arkansas it is held that under the statute of that state, providing that any person owning stock, or who has a special ownership therein, having such stock killed or wounded by a railroad running in the state, may sue such railroad for damages, a lessee of stock under a lease to return the stock in good condition at its expiration may maintain an action for injuries to such stock by the railroad while in his possession.[14]

In Massachusetts the Supreme Court rules that when the location of a railroad, as filed, identifies the land, it satisfies the statute, although the name of the owner of land taken is not stated therein; and filing the location is sufficient notice of the taking. It is not essential that all the land owners should be notified personally by name; and the failure of a railroad company to furnish the owner of land taken by it with a plan of the location will not affect the company's title to the land or suspend the running of the time for applying for damages.[15]

In Pennsylvania the Supreme Court holds that an action of trespass on the case is an appropriate remedy against a railroad company for injuries caused by the construction of its road in such close proximity to a house that the walls of the house are shaken and the house itself filled with smoke, cinders and offensive smells.[16]

In Indiana it is held that railroad companies are not required to fence their tracks at stations and sidings where either freight or passengers are received and discharged, or at cross streets or highways, or at other points where public convenience will not permit fences to be erected, and, consequently, are not liable to pay for animals which may wander on the tracks at such places and be killed without negligence on the part of such companies.[17]

In Colorado, the Supreme Court holds that if a railroad company constructs and operates a railroad in a public street, it is liable to the owner of property abutting on such street, notwithstanding an ordinance of the municipality in terms authorized such use of the street, for the actual diminution in market value of the property for any use to which it may be reasonably put, occasioned by the construction and operation of the railway through such street.[18]

[1] Mo. Pac. R. Co. v. Maffit, 6 S. W. Rep., 600.
[2] Wright v. Gash, 6 S. W. Rep., 704.
[3] State v. N. C. & St. L. R. Co., 6 S. W. Rep., 880.
[4] Com. v. Penn. R. Co., 10 Cent. Rep., 632.
[5] State v. Mo. Pac. R. Co., 6 S. W. Rep., 862.
[7] State v. Union Trust Co., 6 S. W. Rep., 897.
[8] Powell v. D., S. & G. R. Co., 16 Pac. Rep., 863.
[9] St. L., F. S. & W. R. Co. v. Willis, 16 Pac. Rep., 728.
[9] C. K. & W. R. Co. v. Commis., 16 Pac. Rep., 828.
[10] Garrison v. Baggage Trans. Co., 6 S. W. Rep., 701.
[11] Pac. Ex. Co. v. Darnell, 6 S. W. Rep., 765.
[12] Block M. D. Trans. Co., 6 S. W. Rep., 881.
[13] Balt. & O. R. Co. v. Davis, 10 Cent. Rep., 630.
[14] St. L., I. M. & S. R. Co. v. Beggs, 6 S. W. Rep., 724.
[15] Brock v. Old Colony R. Co., 5 N. Eng. Rep., 724.
[16] Northern Cent. R. Co. v. Hiland, 10 Cent. Rep., 746.
[17] Beckdolt v. G. R. & Ind. R. Co., 10 Cent. Rep., 53.
[18] Denver & R. G. R. Co. v. Bourne, 16 Pac. Rep., 839.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Boston & Providence, special meeting, 153 Tremont street, Boston, Mass., April 11.

Allegheny Valley, annual meeting, Pittsburgh, Pa., April 10.

Atchison, Topeka & Santa Fe, annual meeting, Topeka Kan. May 10.

Chicago, Burlington & Quincy, annual meeting, Chicago, Ill., May 16.

Chicago & Grand Trunk, annual meeting, Chicago, Ill., April 11.

Chicago, Rock Island & Colorado, special meeting, Denver, Col., April 30.

Colorado Central, annual meeting, Denver, Col., April 10.
Delaware & Hudson Canal Co., annual meeting, 21 Cortlandt street, New York, May 8.
Kansas City, Clinton & Springfield, annual meeting, Kansas City, Mo., April 7.
Kansas City, Springfield & Memphis, annual meeting, Kansas City, Mo., April 7.
Lake Shore & Michigan Southern, annual meeting, Cleveland, O., May 2.
Long Beach, Whittier & Los Angeles County, annual meeting, San Francisco, Cal., April 11.
Long Island, annual meeting, Long Island City, April 10.
Long Island City & Flushing, annual meeting, 115 Broadway, New York City, April 10.
Mahopac Falls, special meeting, 69 Wall street, New York, April 19.
Michigan Central, annual meeting, Detroit, Mich., May 3.
New York Central & Hudson River, annual meeting, Albany, N. Y., April 18.
New York, Chicago & St. Louis, annual meeting, Cleveland, O., May 2.
Richmond & Danville, special meeting, Richmond, Va., May 21.
St. Louis, Arkansas & Texas, annual meeting, St. Louis, Mo., May 3.
Topeka, Salina & Western, annual meeting, Topeka, Kan., May 1.
Union Pacific, annual meeting, 101 Tremont street, Boston, Mass., April 25.
Washington, Western & Southwestern, special meeting, Staunton, Va., April 26.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Atchison, Topeka & Santa Fe, quarterly, 1½ per cent., payable May 15.
Camden & Atlantic, 2½ per cent., on preferred stock, payable April 16.
Delaware, Lackawanna & Western, quarterly, 1½ per cent., payable April 20.
Long Island, quarterly, 1 per cent., payable May 2.
Nashville, Chattanooga & St. Louis, 1 per cent., payable April 20.
St. Louis & San Francisco, 2½ per cent. on the preferred stock, payable April 30.
St. Paul, Minneapolis & Manitoba, quarterly, 1½ per cent., payable May 1.
Vermont & Massachusetts, $3 per share, payable April 7.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

Association of North American Railroad Superintendents will hold its fifteenth annual meeting in New York City, April 9 and 10

The *General Time Convention*, spring meeting, will be held at the Hotel Brunswick in New York, April 11.

The *Master Car-Builders' Association*, annual convention, Alexandria Bay, N. Y., commencing June 12.

The *American Railway Master Mechanics' Association*, next annual convention, Thousand Islands, N. Y., June 19.

The *New England Railroad Club* meets at its rooms in the Boston & Albany passenger station, Boston, on the second Wednesday of each month.

The *New York Railroad Club* meets at its rooms, 113 Liberty street, New York City, on the third Thursday of each month.

The Western Railway Club meets in Chicago the third Wednesday in each month.

The *Central Railway Club* meets at the Tifft House, Buffalo, the fourth Wednesday of January, March, May, August and October.

The *American Society of Civil Engineers* holds meetings on the first and third Wednesday in each month at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular monthly meetings at its rooms in the Boston & Albany station, Boston, at 7:30 p. m. on the third Wednesday of each month.

The *Western Society of Engineers* holds its regular meetings at its hall, No. 15 Washington street, Chicago, at 7:30 p. m., on the first Tuesday of each month.

The *Engineers' Club of St. Louis* meets the first and third Wednesday of each month till June.

The *Engineers' Society of Western Pennsylvania* meets in Pittsburgh the third Tuesday of each month.

The *American Train Dispatchers' Association* will hold its fifth annual meeting at Louisville, Ky., June 12.

The *National Association of General Passenger and Ticket Agents* will hold its fall meeting in Saratoga, N. Y., Sept. 18.

New England Railroad Club.

The regular monthly meeting of the club will be held on Wednesday, April 11, at 7:30 p. m., at the Rooms, in the Boston and Albany Station, Boston. The subject for discussion is Heating Passenger Cars by Steam.

Lehigh Valley Iron Manufacturers.

The representatives of the blast furnaces and other iron manufacturers of the Lehigh Valley held a largely attended meeting in the office of the Thomas Iron Co. at Easton, March 29, to consider the present general unsatisfactory condition of their business as manufacturers. Frederick A. Prime, of Philadelphia, was chosen President, and Hon. William H. Ainey, of Allentown, Secretary. Of the forty blast furnaces in this region all were represented at the meeting except the Carbon Iron Co.

It was the unanimous opinion of those in attendance that it was no longer possible to compete with manufacturers and sellers of iron from abroad, and with Southern and Western furnaces, at the present rates of freight charged to the producers here. Many instances were related where present producers in the South and West, having many other local advantages, including cheaper labor and fuel, are guaranteed rates of freight on their materials and products at from 33 to 50 per cent. lower than is charged the producers in this valley for a term of years.

A committee of seven interested in the blast furnaces was appointed to lay the situation before the proper officials of the different railroad and coal companies, and a similar committee of three, representing the rolling-mills and other iron manufacturers, was appointed to co-operate with the furnaces in seeking some practical relief. It was stated that more than two-thirds of the furnaces in the Lehigh Valley had been forced into idleness by the generally unsatisfactory conditions of the iron business in the valley, and those that were running were doing so at a loss. The committee representing the furnaces is as follows: William H. Ainey, of the Lehigh Iron Company and Coplay Iron Company; John Thomas, of the Thomas Iron Company; Joseph C. Kent, of the Andover Iron Company; Geo. T. Barnes, of the Crane Iron Company; Professor F. A. Prime, of the Allentown Iron Company; Mr. Janney, of the Glendon Iron Company, and J. G. Fell, of the Allentown Rolling Mill Furnaces. The committee representing the rolling mills and other iron manufacturers is composed of H. W. Allison, of the Allentown Rolling Mills; Oliver Williams, of the Catasauqua Manufacturing Company, and Mr. Howe, of the Delaware Rolling Mills.

PERSONAL.

—Jacob N. Victor has resigned the position of Superintendent of the California Southern and Central roads, and the position has been abolished.

— Hon. Frank T. Campbell, who succeeds Mr. Coffin as Railroad Commissioner of Iowa, has been prominent in Iowa politics for many years, having been a member of the Senate in 1874, and Lieutenant-Governor and President of the Senate in 1878.

—Calvin H. Allen, who succeeds G. Clinton Gardner as President of the Western New York & Pennsylvania, has had a large and varied experience in the 39 years that he has been connected with railroads in the positions of Chief Engineer, Superintendent and General Manager. He has been Vice-President of this company since 1883.

— The retirement of Railroad Commissioner L. S. Coffin, of Iowa, is a matter of regret. Mr. Coffin has done vigorous work in drawing attention to the perils of the trainman's life, and in furtherance of plans for the cure of the evils connected therewith. This work, as well as other commendable activities in which he has been engaged, has been done from the highest motives, and his integrity is patent to all who know him. As a public speaker he is enthusiastic and convinces his hearers; and industry and energy of Mr. Coffin's sort would be valuable in many a railroad commission outside of Iowa.

—Mr. Thomas Elliot Harrison, a well-known English civil engineer, a Past President of the Institution of Civil Engineers and Engineer in Chief of the Northeastern Railway, died suddenly on March 20 at the age of 80. He was one of the last survivors of the engineers who were assisted with George Stephenson in the surveys and execution of his early railroads. One of Mr. Harrison's earliest works, completed over 50 years ago, was an arched bridge of 240 ft. span, 157 ft. high from the foundation. He had an excellent reputation for judgment and integrity, and was instrumental in introducing hydraulic power for working swing bridges, switching, etc., at freight houses, and was one of the first engineers in England to adopt the Westinghouse brake on passenger trains. He was connected with the Northeastern for over 50 years, most of the time as engineer in chief, and died in harness.

ELECTIONS AND APPOINTMENTS.

Aberdeen, Sioux Falls & Montana.—The following are officers of this Dakota company: C. A. Jewitt, President; F. H. Hagerty, Vice-President; J. H. Drake, Secretary; H. M. Marple, Treasurer, and C. A. Bliss, General Manager.

Calabas, Tucson & Northwest.—The following directors have been elected: Charles Dodge, C. P. Sykes, W. de L. Benedict, H. D. Faulkner, P. R. Green, John Van Nast, Eugene M. Cole, George Scofield, E. K. Sykes, Edward Benedict, H. S. Stevens, Charles R. Drake and Stephen H. Thayer.

California Southern.—The office of Superintendent has been discontinued. The headquarters of the Assistant-Superintendent has been removed from Los Angeles to San Bernardino.

Canton & Waynesburg.—The following directors have been chosen: Louis Schaefer, H. Kennedy, J. Wardwell, Charles Cook, and Marsh Barber.

Central of Georgia.—C. R. Barnhart has been appointed Master of Transportation, with office at Savannah, Ga.

Central Traffic Association.—Charles L. Shaw, Secretary of the Chicago Committee of the Association has been appointed Chairman, vice William Borner resigned.

Chicago & Alton.—At the annual meeting held in Chicago, April 2, the following directors were elected: John Crerar, Lorenzo Blackstone and John J. Mitchell for the term of three years, and Albert A. Sprague to serve two years, the unexpired term of George Straut, deceased. The directors re-elected the present officers of the company. There were 138,912 votes polled out of a possible 175,617.

D. Brock has been appointed Division Superintendent of the Kansas City and St. Louis Divisions, with headquarters at Roodhouse, Ill., vice S. D. Reeves, resigned.

Chicago, Burlington & Quincy.—George A. Cowan has been appointed Traveling Freight Agent, with headquarters at Buffalo, N. Y.

Cincinnati & Birmingham.—The following directors have been elected: W. A. Wyley and J. A. Jones, Woodbury; J. B. Thomason, Mulberry; H. K. Bryson, Fayetteville; W. D. L. Record, Lynchburg; W. R. French, Tullahoma; J. D. Wooten, Manchester; M. R. Campbell and G. R. Crane, Tullahoma. The directors elected M. R. Campbell President; W. C. Morgan, Secretary, and G. R. Crane, Treasurer.

Cleveland, St. Louis & Kansas City.—The directors of this new Missouri company are: F. J. Mathews, T. C. Delaven, M. H. Collins, C. M. Sweet and R. S. Beckman, of New York.

Cortez & Dolores.—The following are the officers of the company: President, B. L. Arbecam, Boston, Mass.; Vice-President, J. W. Hanna, Cortez, Col.; Secretary and Treasurer, E. L. Turner, Cortez. The above officers and A. H. Havemeyer, Newburgh, N. Y., and E. T. Wells, Denver, Col., constitute the board of directors.

Columbus & Cincinnati Midland.—The following directors were elected at the annual meeting held last week: Orland Smith, S. Spencer, Charles Parrot, Henry Miller, James A. Wilcox, James Watson, C. C. Hoover, George Hoadley, T. Ewing Miller. The officers re-elected are: Orland Smith, President; Theo. H. Buehler, Treasurer; S. P. Peabody, Secretary.

Columbia Short Line.—The incorporators of this Tennessee company are N. N. Cox, E. C. McDowell, John H. Moore, George L. Thomas and Joseph Dew.

Cumberland Valley & Martinsburg.—The following have been elected directors and officers of the company, as re-organized: Thomas B. Kennedy, J. J. Boyd, Ch uncey Ives, John Stewart, A. L. Langdon, E. Boyd Faulkner, A. J. Thomas, William T. Stewart and George M. Bowers. Officers: Thomas B. Kennedy, President; F. Inglis, Secretary, and W. L. Ritchey, Treasurer.

Decatur, Chesapeake & New Orleans.—The following are the officers of the company: G. C. Sandusky, President; W. A. Frost, Secretary and Treasurer; Josiah Flournoy, Chief Engineer. The general office is at Shelbyville, Tenn.

Eastern Minnesota.—Howard James has been appointed Secretary.

Erie & Huron.—M. C. Dickson has been appointed General Freight and Passenger Agent, with headquarters at Chatham, Ont., vice W. N. Warburton.

Eureka Springs.—At the annual meeting, held in Eureka Springs, Ark., the following officers and directors were elected: Powell Clayton, President and General Manager; Logan H. Roots, Vice-President and Treasurer; Arthur H. Foote, Secretary. Directors: R. C. Kerens, St. Louis, Mo.; E. W. Taylor, Jefferson, Tex.; Nathan Herrmann, New York; Logan H. Roots, P. K. Roots, Little Rock, Ark.; C. H. Smith, St. Louis, Mo.; Powell Clayton, F. M. Richardson, A. H. Foote, Eureka Springs, Ark.

Eutawville.—At the annual meeting in Charleston, S. C., the following officers and directors were elected: President, Rufus C. Barkley; Vice-President, John Harlin; Secretary, Arthur L. Merriam; Treasurer, Oliver M. Chace; General Manager, J. W. Fowler. Directors: Rufus C. Barkley, John Harlin, Samuel J. Pregnall, L. Lissberger, W. A. McKenna, A. Ames Howlett, Arthur L. Merriam.

Forest City & Watertown.—The following officers were elected at the recent annual meeting: R. M. Springer, President; A. N. Smart, First Vice-President; W. H. Doble, Second Vice-President; B. F. Bulloul, Secretary; H. F. Doble, Treasurer; Ira T. Timberlake, Comptroller; F. E. Hutchins, General Manager; Nelson L. Graffam, Counsel. The general offices are at Forest City, Dak.

Fresno, Belmont & Yosemite.—The following are the directors of this California company: E. C. Winchell, President; T. C. White, Vice-President; A. M. Drew, Secretary; C. Chisholm, H. P. Hedges, W. R. Thomas and J. P. Vincent, all of Fresno City, Cal.

Grand Rapids & Indiana.—C. M. Lanning has been appointed Traveling Freight Agent, with headquarters at Grand Rapids, vice E. Baker, transferred.

Halifax & Indian River.—The incorporators of this Florida company are U. J. White, Ormond; Frank W. Sams, New Smyrna; W. B. Watson and Samuel B. Carter, Jacksonville, Fla.; and John T. Salter, New York City.

Iowa Railroad Commission.—Hon. Frank T. Campbell has been confirmed as Railroad Commissioner in place of L. S. Coffin, whose term has expired.

Jacksonville & St. Augustine Short Line.—The following are the incorporators of this Florida company: Charles Williams, Manchester, N. H.; W. T. Sylvester, Jacksonville, Fla.; J. G. Van Tassell, New York City; David Grauman, Jacksonville, Fla.; B. F. Oliveros, St. Augustine, Fla.; D. W. Trumpeller, Jacksonville, Fla.

Kansas City, Independence & Lee's Summit.—The following are the officers of the company: President, J. W. Mercer; Treasurer, H. P. Churchill; Chief Engineer, William B. Knight. The general offices are at 40 Security Building, Kansas City, Mo.

Kansas City, Rich Hill & Southern.—The following are the officers of this Missouri company: President, S. F. Scott, Kansas City, Mo.; General Manager, S. P. Kellar, Kansas City; Chief Engineer, J. W. Heylmun, Rich Hill, Mo.

Long Island.—Benjamin Norton has been elected Second Vice-President, with office in New York. C. R. Fitch has been appointed Assistant Superintendent. H. M. Smith has been appointed Traffic Manager.

Louisville, New Albany & Chicago.—Charles F. Martin has been appointed General Agent at Louisville, Ky., vice Samuel Phillips, resigned.

Memphis, Oxford & Columbus.—John W. Dillard has been elected President of the company and W. D. Wilkerson Secretary.

Memphis, Tuskaloosa & Atlantic.—The incorporators of this Alabama company are: A. C. Hargrove, W. C. Jemison, T. N. Hays, W. F. Fitts, G. A. Searcy, H. F. Hill, W. C. Cochrane, B. Friedman and Z. Shirley, of Tuskaloosa County.

Mobile, Hattiesburg & Jackson.—O. F. Cawthon is President of this company, and H. Austill is Vice-President and General Manager. The general office is at Mobile, Ala.

New Haven & Derby.—J. P. Hopson has been appointed Superintendent, with office at New Haven, Conn., vice E. S. Quintard, resigned.

Northern Pacific.—J. D. Finn has been appointed Superintendent of the Yellowstone division, with office at Glendive, Mont., vice F. W. D. Holbrook.

Robert Low has been appointed Superintendent of the Montana Division, with headquarters at Livingston, Mon., vice M. L. Vining, transferred.

Panama.—The following directors were elected at the annual meeting held in New York, April 2: John Newton, R. W. Thompson, Julius W. Adams, Samuel R. Probasco, Charles Coudert, D. A. de Lima, D. O. Mills, L. de Bebian, G. Amsinck, W. B. Dinsmore, Robert A. Chesebrough, E. A. Drake and Ernest L. Oppenheim. Messrs. Thompson, Mills and Dinsmore are the only survivors of the old Board. Those dropped are: J. G. McCullough, the President; Jesse Seligman, C. H. Coster, John W. Ellis, Theo. J. de Sabla, Charles G. Francklyn, Joseph Ogden, Thomas Maddock, George Garr and E. F. Winslow.

Pennsylvania.—The new Board of Directors has organized by electing the following officers: President, George B. Roberts; First Vice-President, Edmund Smith; Second Vice-President, Frank Thomson; Third Vice-President, J. N. DuBarry; Fourth Vice-President, John P. Green; Secretary, John C. Sims, Jr., and Treasurer, Robert W. Smith.

Pennsylvania Company.—It is announced that E. B. Taylor has been appointed to the position formerly held by W. A. Baldwin, with the title of General Superintendent of the Northwestern lines.

Philadelphia & Atlantic City.—W. H. Blood has been appointed General Dispatcher, vice J. B. Griffith, resigned. Office at Camden, N. J.

Philadelphia, Wilmington & Baltimore.—George B. Roberts has been chosen President, vice Isaac Hinckley, deceased.

Pittsburgh, Cincinnati & St. Louis.—J. J. Turner has been appointed Superintendent, with office at Pittsburgh, vice E B. Taylor.

Pullman Palace Car Co.—The following appointments have been made: E. A. Jewett, Assistant Superintendent; C. A. Garcelon, Superintendent Chicago Division, vice E. A. Jewett, promoted; D. H. Martin, Superintendent St. Louis Division.

St. Ignace, Sault Ste. Marie & Northern.—The following are directors of this new Michigan company: Wm. Chandler, Otto Fowler, J. P. Goff, T. S. B. Sutton and C. S. Osborn, Sault Ste. Marie.

St. Joseph Valley.—David Patterson has been appointed Receiver in place of George Richards, deceased.

San Antonio & Aransas Pass.—E. S. Marshall is now Master Mechanic of this company, with office in Yoakum, Tex.

San Bernardino Central.—This California company has organized with the following officers: President, J. C. Monteith, of San Diego; Vice-President, Joseph Jarvis, of Riverside; Secretary, E. A. Castle, of San Diego; Treasurer, L. M. Holt, of Riverside.

Seattle & Green Lake Circle.—Incorporated in Washington Territory by C. C. Calkins, Seattle; William D. Wood, J. K. McConnell, Dr. Churchill, J. N. Wallingford, William Bremer, George K. Ball, Charles Baker and James A. Moore.

Seattle, Lake Shore & Eastern.—The road between Seattle, W. T., and Gilman has been turned over to the operating department and the following list of officers is announced: J. R. McDonald, President; D. H. Gilman, Vice-President; George G. Lyon, Secretary; F. H. Osgood, Treasurer; W. R. Thornell, General Manager; W. J. Jennings, General Freight and Passenger Agent; F. A. Allen, Auditor; Paul F. Mohr, Chief Engineer; James H. Watson, Superintendent Bridges and Buildings; W. H. Garlock, Master Mechanic.

Selma & Cahaba Valley.—C. H. McKee, Selma, Ala., is Chief Engineer of this company.

Seymour & Southwestern.—The following are the officers of this Indiana company: President, F. M. Swope, Seymour, Ind; Vice-President, S. T. Wells, Vallonia; Secretary, Louis Schneck; Treasurer, Lynn Faulkconer, Seymour, Ind.

Southern Pacific.—R. L. Myrick has been appointed Division Superintendent of the Humboldt division established between Winnemucca and Wells, Nev., with headquarters at Carlin, Nev. C. D. Burkhalter has been appointed Assistant Division Superintendent of the Sacramento and Oregon division and the Central Pacific, with office at Sacramento, Cal.

Springfield & Southern.—Hon. Rufus M. Ramsey, Carlyle, Ill., is President of this Illinois company, and C. D. Hoiles, Greenville, Ill., is Vice-President.

Temisconata.—The following are the officers of this Canada company: President, A. R. McDonald; Vice-President, H. Cameron; Secretary, E. Crane; Chief Engineer, R. Adams Davy. The general office is at Riviere du Loup, Province of Quebec.

Tennessee Coal, Iron & Railroad Co.—W. G. McCormick has been appointed Superintendent of the Pratt Mines Division, vice C. P. Ball, deceased.

Western, New York & Pennsylvania.—The new board of directors have elected the following officers: President, C. H. Allen; First Vice-President, Gustave E. Cissel; Second Vice-President, S. F. Decoursey; Secretary, J. R. Trimble. The resignation of John Dougherty as treasurer was received, and his successor will be elected at the next meeting.

Wichita, Meade Centre & Western.—The incorporators of this Kansas company are: O. B. Hamilton, M. J. O'Meara, W. G. Emerson, Coleman Rogers, James Wilson, Chester Munson and W. K. Palmer, of Meade Centre; J. F. Kern, Santa Fe; C. K. Ingraham, Appomattox; Lewis Haas, Johnson City; D. A. Perkins, Mertilla; A. J. Hoisington, Garden City.

Wisconsin Central.—John J. Callaghan has been appointed Superintendent of Bridges and Buildings, with office at Steven's Point, Wis., vice P. Walling, resigned. Thomas C. Clifford has been appointed Superintendent of the Minnesota, St. Croix & Wisconsin and Chippewa Falls & Western roads, with office at St. Paul.

OLD AND NEW ROADS.

New Companies Organized.—Cleveland, St. Louis & Kansas City.—Columbia Short Line.—Halifax and Indian River.—Memphis, Tuscaloosa & Atlantic.—Ossining.—St. Ignace, Sault Ste. Marie & Northern.—San Bernandino Central.—Seattle & Green Lake Circle.—Wichita, Meade Centre & Western.

Aberdeen, Sioux Falls & Montana.—Organized in Dakota to build a road from Aberdeen southeast to Sioux Falls, a distance of about 165 miles.

Anaheim, Olinda & Pamona.—The grading has been completed from Anaheim, Cal., to Placentia.

Anglesea.—It is stated that the West Jersey will manage and operate this road as part of its system after the sale has been made, and will provide additional rolling stock.

Atchison, Topeka & Santa Fe.—The directors have decided to lease the Southern Kansas, guaranteeing the interest of the 6 per cent. income bonds, the charges on which will amount to about $90,000. Several thousand dollars will be saved by this arrangement, as it will obviate the necessity of a separate management and auditing department at Lawrence, Kan.

The directors also declared a quarterly dividend of 1½ per cent., reducing the yearly rate from seven per cent. to six. It has been decided to open the Kansas City-Chicago line for through business May 1.

The tracklaying on the line to Redondo Beach, Cal., will probably be completed next week. When it is completed the tracklayers will be transferred to San Juan-by-the-Sea, and will commence laying the track toward Oceanside.

Atlanta & Florida.—The road has been completed from Williamson, Ga., on the Georgia, Midland & Gulf, to Zebulan, Pike County, 52 miles south of Atlanta.

Atlantic, Atlanta & Great Western.—Five hundred thousand dollars have been subscribed by the counties through which the road will pass, and arrangements for building the line are now being completed with a construction company. George T. Fry, Atlanta, Ga., is President.

Baltimore & Ohio.—The Maryland Legislature has passed a law providing for the termination of the charter of the Baltimore & Ohio Relief Association on April 1, 1889. Mr. John K. Cowen, general counsel of the road, says that ever since the incorporation of the association in 1882, two years after it began operations, there have been attempts by "professional agitators" (Knights of Labor) to interfere with it; and that the road has now asked for the repeal of the charter, so that the organization may be managed as a department of the railroad company. He says that 95 per cent. of the men like the association and that it will be continued in all its essential features under the new form.

Boston, Concord & Montreal.—A bill in equity has been filed by this company against the Boston & Maine, asking for an injunction to restrain the latter company from continuing the operation of the road, and the appointment of a receiver,

Cahuenga Valley.—Incorporated in California, with a capital stock of $100,000, by A. I. Hall, D. W. Field and others.

Cape Girardeau Southwestern.—The survey has been completed for the extension from Wellsdale, Mo., to a point on the Current River branch of the Kansas, Springfield & Memphis, in Carter County, to be called Hunter. On the first section of 13 miles grading has been commenced, and the contracts for the rest of the extension will soon be let. Louis Honck, Cape Girardeau, Mo., is President.

Central of Georgia.—The extension from Blakely, Ga., southwest about 10 miles to Columbia, Ala., on the Chattahoochie River, will be completed this week.

Chattanooga, Rome & Columbus.—The road has been laid with steel rails between Rome, and Cedartown, Ga., and the track has been completed south from the latter place to within six miles of Buchanan, Haralson County, about 20 miles from Cedartown.

Chicago & Canada Southern.—Judge Brown, of the United States Circuit Court at Detroit, has ordered the road to be sold under foreclosure in Detroit, unless the past due interest on the first-mortgage bonds, amounting to $3,931,069, is paid on or before Aug. 8 of this year. The line was originally projected as an extension of the Canada Southern to Chicago, and starts from Grosse Isle, on the American side of Detroit River, and runs to Fayette, O., a distance of 67 miles. It has been operated for several years by the Lake Shore & Michigan Southern.

Chicago, Kansas & Nebraska.—The plans for the extension west from Norton, Kan., to Colorado Springs, Col., have been materially changed from those at first intended. The Union Pacific had surveyed and acquired the right of way for a line between Colby, Kan., and River Bend, Col., which it intended to build to shorten its present road and to avoid some heavy grades. The extension of this company would parallel this line for 120 miles, but arrangements have been concluded by which the Chicago, Rock Island & Pacific will construct the road, and the two companies operate it, the Union Pacific paying a percentage of the cost of construction and valuation for the privilege.

Chicago, Madison & Northern.—The track of the Freeport, Dodgeville & Northern has been completed to Dodgeville, Wis.

Chicago, Milwaukee & St. Paul.—It has been decided to construct a line from Mather's, Juneau County, Wis., northwest about 30 miles to Black River Falls, on the Chicago, St. Paul, Minneapolis & Omaha, conditional upon the latter place subscribing $10,000. The road would virtually parallel the Chicago, St. Paul, Minneapolis & Omaha.

Chicago & New Orleans.—The survey will probably commence about April 9, and will start near Effingham, Ill., and run south to a point on the Ohio River, in Massac County, opposite Paducah, Ky., a distance about 150 miles. George A. Sanders, Springfield, Ill., is President.

Cincinnati & Birmingham.—It is stated that work on this road will soon be commenced. It is to extend from Birmingham, through Huntsville, Ala., and Tullahoma, Tenn., to Somerset, Ky., on the Cincinnati Southern. A. G. Negley, Tullahoma, Tenn., is Chief Engineer.

Cleveland, St. Louis & Kansas City.—Incorporated in Missouri to construct a road 20 miles in length from a point in St. Charles County, Mo., on the Mississippi River opposite Alton, Ill., south to St. Louis and to connect with or build a bridge over the Mississippi at Alton, also to build, purchase, etc., a road from Alton to Kansas City, passing through the counties of St. Charles, Warren, Montgomery, Callaway, Boone, Howard, Saline, Pettis, Lafayette, Johnson and Jackson. The capital stock is $1,500,000. The company is a reorganization of the Central Missouri, in which Col. J. T. K. Hayward, Hannibal, Mo., is interested.

Columbia Short Line.—Chartered in Tennessee to construct a road from Woodbury, Cannon County, west through Columbia to Linden, Perry County, a distance of about 95 miles.

Decatur, Chesapeake & New Orleans.—The right of way from Decatur, Ala., to Shelbyville, Tenn., has been secured and nearly all the subsidies asked for subscribed, and work between these points will probably be commenced early in May. It is proposed to continue the road on to Gallatin. It is intended to reach the Chesapeake & Ohio on the north and the Mobile & Ohio on the southwest.

Florida Railway & Navigation Co.—The Peninsular road, extending from Waldo, Fla., to Ocala, with a branch to Silver Springs, about 100 miles of road, was sold this week to W. Bayard Cutting for $10,000. The Fernandina & Jacksonville, a 25 mile road was sold to the same party for $5,000. The sale of the Peninsular road was postponed till May 7.

Fort Smith, Paris & Dardanelle.—The President has stated that work will be commenced on the road within 90 days if $40,000 is raised. The contracts will be let this month. Thomas Boles, Fort Smith, Ark., is President.

Fresno City, Belmont & Yosemite.—It is expected that the road will be completed from the Southern Pacific depot in Fresno City, Cal., east a distance of 8½ miles about April 20. Extensions are contemplated north to the Yosemite Valley and the Pine Ridge Forests of the Sierra Nevada Mountains. The officers are given in another column.

Georgia Southern & Florida.—The survey has been completed from Valdosta, Ga., south to Palatka, Fla., the terminus of the road, 135 miles from Valdosta. H. J. Lamar, Macon, Ga., is President.

Jacksonville & St. Augustine Short Line.—Incorporated in Florida to build a road from Jacksonville south to St. Augustine.

Jacksonville Southeastern.—An extension from Drivers, Ill., southeast to Mt. Vernon, about five miles, is said to be contemplated by the company.

Kentucky.—Governor Buckner has returned to the Legislature, without his approval, the bills incorporating the following railroad companies: Buffalo & Hodgesville, Cloverport & Fordsville, Cairo & Memphis, Cincinnati, Jellico & Cumberland.

Kentucky Midland.—The location has been completed from Frankfort, Ky., easterly through Georgetown, Paris, Sharpsburg, and Owingsville to Salt Lick on the Newport News & Mississippi Valley, and it is expected that the contracts will soon be let. The four counties through which the road passes have voted aid to the amount of $650,000. James M. Douglass, Frankfort, Ky., is President.

Lehigh Coal & Navigation.—A survey is being made from Phillipsburg, N. J., 14 miles north to Belvidere, where connection will be made with the Lehigh & Hudson River, over whose road the New England states will be reached.

Lehigh Valley.—The Legislature of New Jersey has passed a bill under which the Morris Canal, operated by this road, may be abandoned for navigation purposes. The canal was leased to the road in 1871 and has been operated at a loss for several years, the completion of the New Jersey Division of the railroad line rendering it comparatively useless. There has been opposition to the law authorizing abandonment, from Jersey City and Newark, where it is understood that the canal is to be used as a source of city water supply. The right to sell water for city supply was granted to the Morris Canal many years ago.

Louisville & Nashville.—It is reported that the company will build a branch about 10 miles in length from Calera, Ala., east to Shelby Iron Works.

Memphis, Tuskaloosa & Atlantic.—Incorporated in Alabama to construct a road from Woodstock, on the Alabama Great Southern, west to Columbus, Miss., on the Georgia Pacific, a distance of about 80 miles.

Missouri Pacific.—A survey is being made from Lake City, Mo., west to Kansas City. The company is endeavoring to secure a better grade than that furnished by the line of the Lexington branch.

Mobile, Hattiesburg & Jackson.—The permanent location has been completed for 20 miles. The engineers are now in the field near Hattiesburg, Miss. It is expected that about 20 miles will be built from funds raised, and then the road will be bonded at $17,000 per mile and finished with the proceeds of the bonds. The road will extend from Mobile, Ala., northwest to Jackson, Miss., passing through Hattiesburg, on the New Orleans & Northeastern, and Brandon, on the Vicksburg & Meriden, a distance of about 160 miles.

Montgomery & Birmingham.—The engineers in charge of Col. Cary A. Wilson have completed the survey from Montgomery, Ala., northwest through Prattville, to Maplesville, on the East Tennessee, Virginia & Georgia, a distance of about 50 miles.

Nashville, Chattanooga & St. Louis.—The stockholders have ratified the purchase of the Duck River Valley narrow gauge road, which extends from Columbia to Fayetteville, 48 miles, and have authorized the change of the gauge to standard, and the provision of additional equipment. A consolidated five per cent. first mortgage bond of $20,000,000 will be issued to take up the floating debt.

New Roads.—A survey has been commenced for a road to start from Cartersville, Ga., on the Western & Atlantic, northeast to Gainsville, on the Richmond & Danville, a distance of about 60 miles.

New York & Northern.—The Receiver has delivered the property, franchises and rights of the New York City & Northern, which were sold under foreclosure, to this company.

New York, Ontario & Western.—All the most important engine repairs will hereafter be done at Middletown, and the car repairs at Norwich. Most of the men and machinery of the Oswego shops will be transferred to these points, and only light repairs will be done at the latter place. Nearly 200 men are affected by the change.

Old Colony.—The company will construct a second track between Mansfield and Attleboro Junction. It is stated that the Stoughton branch of the Boston & Providence will also be double tracked, thus giving the Fall River trains of the Old Colony a direct route to the Boston & Providence station in Boston.

A survey from Pratt's Junction, Mass., northwest to Gardner, is said to have been made by this company.

Ossining.—Incorporated to build a three-mile road from Sing Sing, N. Y., to Whitson's station on the New York & Northern. John V. Cockecroft is President.

Philadelphia & Reading.—The Philadelphia, Gloucester & Mt. Ephraim will be extended this summer from Mt. Ephraim, N. J., about 7 miles to Blackwood.

Richmond & West Point Terminal.—The directors have formally authorized and approved the recently proposed plan for funding the present outstanding second mortgage income bonds of the Georgia Pacific, together with the past due interest on the bonds. The plan provides that 50 per cent. of the principal and past due interest of the bonds shall be funded into a regular fixed 5 per cent. second mortgage bond, and the other 50 per cent. into an ordinary non-cumulative 5 per cent. income bond.

Rocky Fork & Cooke City.—The location has been completed for about 120 miles, 46 miles of which are graded, and tracklaying will soon be commenced upon this part of the road. H. C. Davis is President.

St. Ignace, Sault Ste. Marie & Northern.—Organized to construct a road between Sault Ste. Marie and St. Ignace, Mich. It is stated to be in the interest of the Grand Rapids & Northern.

St. Louis, Arkansas & Texas.—The track of the road has been completed to Fort Worth, Tex.

St. Louis, Kansas City & Colorado.—It is stated that an extension will probably be built through Versailles, Mo., to Lexington, Mo.

Santa Rosa & Carquinez.—The grading on the road has been completed, with the exception of about 12 miles between Glen Ellen, Cal., and Santa Rosa, upon which a force of about 300 men, who have been transferred from the San Joaquin Valley, are at work. The track is being laid by a force of about 50 men, and it is expected that the road will be in operation between Napa Junction and Santa Rosa, a distance of about 37 miles, early in June. It is a branch of the Southern Pacific.

Seattle & Green Lake Circle.—Articles of incorporation filed in Washington Territory to construct a road north from Seattle to Green Lake. The survey is now being made and work will probably be commenced soon.

Seattle & West Coast.—The road has passed into the control of the Seattle, Lake Shore & Eastern.

Sheffield & Birmingham Coal, Iron & Railroad.—The company will erect a machine shop and roundhouse at Sheffield, Ala.

Springfield & Southern.—It has been decided to mortgage the road, and the president and vice-president have been appointed a committee to arrange the matter. The line, as surveyed, extends from Springfield, Ill., south to Murphysboro, a distance of about 140 miles.

Southern Pacific.—A road will be built from Montague, Siskiyou County, Cal., on this road, west seven miles to Yreka, by the citizens of the latter place.

Virginia, North Carolina, Tennessee & Western.—The company proposes to construct a road from Portsmouth, Va., southwest to North Carolina, and then through the northern tier of counties of that state and Tennessee to

Stewart County, and then through Calloway, Graves and Kickman counties in Kentucky, to Columbus on the Mississippi River, a distance of about 750 miles, which it is said will be completed in five years. A branch is also proposed from Springfield to Nashville. Thomas Breen, Knowlton, Pa., is President.

Warrior Coal Fields.—This company has been consolidated with the Pensacola & Memphis, which is to extend southeast from Meridian, Miss., to Pensacola, Fla. Col. N. B. Lord, 38 Park Row, New York, is Secretary.

Wichita, Meade Centre & Western.—Incorporated in Kansas to construct a road through Comanche County west through the two lower tiers of counties to the state line. The capital stock is $1,000,000, and the general office is at Meade City.

TRAFFIC AND EARNINGS.

Railroad Earnings.

The statement of the New York, Lake Erie & Western for February and five months from Oct. 1 to Feb. 29, is as follows:

Month of February:	1888.	1887.	Difference.
Gross earnings.	$2,048,279	$1,923 665	+ $124 614
Operating expenses.	1 438,981	1,327.0.2	+ 111.929
	$609,297	$596,613	+ $12 684
Due leased lines. ...	167,8.2	162,483	+ 531.972
Net earnings.....	$441.494	$434,120	+ $7.364
Oct. 1 to Feb. 29:	1887-8.	1886-7.	
Gross earnings $11.111.5 6		$10.699,368	+ $412.147
Operating expenses.	7,449.517	6,982.290	+ 467.226
	$3,661,998	$3,717,077	— $55.079
Due leased lines.....	990,213	964.596	+ 25 617
Net earnings.....	$2 671.785	$2,752,481	— $80,696

Earnings of railroad lines for various periods are reported as follows:

Month of February:	1888.	1887.	Inc. or Dec.	P c.
Allegheny Valley	156,350	133,659	I. 22,691	16.9
Net....	66,729	44,926	I. 21,803	48.6
Balt. & Potomac.	113,949	110,528	I. 3,421	3.1
Net	36.605	32,819	I. 3,786	11.5
Cairo, V. & C. ...	54,914	50,766	I. 4,148	8.2
Net....	12.269	10.950	I. 1,319	12.0
Cam. & A. & Br..	33,341	25,804	I. 7,537	29.2
Net	Def. 3,283	Def. 15.109	I. 11,826	....
Canadian Pac. ..	837,994	510,646	I. 327.348	64.2
Net	46.922	Def. 69,440	I. 116,362	...
C., I., St. L. & C.	200.194	196,671	I. 3,523	1.8
Net	68,033	75,553	D. 7,520	9.9
Cleve. & Canton.	26,370	22,551	I. 3,819	16.9
Net..	6,465	2,169	I. 4.296	198.0
C., C., C. & I....	522,520	523,087	D. 567	....
Net.....	113,703	149.979	D. 36.276	24.2
Den. & R. G. W.	88.049	70,747	I. 17,332	24.4
Net	13,588	17,204	D. 3,616	21.3
Det., B. C & Al .	34,726	26 083	I 8,643	33.2
Net	12,558	12,086	I. 472	3,9
Ft. W. & Den. C..	71 349	40,039	I. 31,310	75.8
Net	29,169	16,579	I. 12.590	75.8
Kentucky Cent...	71,301	64,232	I. 7,069	11 0
Net.....	26,217	20,743	I. 5,474	26.4
Keok. & West....	24,788	24.197	I. 591	2.4
Net.....	5,431	7,757	D. 2,326	29.9
L., N. O. & Tex.	225,660	179,230	I. 46,430	25.9
Net...	71,648	53,564	I. 18.084	33.7
Mem. & Charles.	144,618	125,375	I. 19,243	15.4
Net.....	31,874	54.810	D. 22,936	41.8
N. Y., L. E. & W.	2,048,280	1,923,665	I. 124.215	6.6
Net ...	441,495	434,130	I. 7,365	1.7
N. Y., Ont. & W.	108.136	86,405	I. 21,731	25.2
Net.....	4,929	794	I. 4,145	....
Northern Pacific.	936.085	525,728	I. 410,357	78.0
Net	187.930	26,602	I. 161.318	....
Ohio & Miss.....	290 678	311,028	D. 20.350	6.6
Net	71,000	85,519	D. 14.519	17.0
Oregon R.& N.Co.	445 247	240,840	I. 204,427	85 2
Net...	141,862	48,314	I. 93,548	194.9
Pennsylvania	4,379,455	3,988,788	I. 390,667	9.8
Net	1,358,283	1,380,157	D. 21,874	1.6
Pitts. & West ...	133 405	125,101	I. 8,304	6.6
Net.....	33,029	.....	.....	....
Tol. & Ohio C....	103,257	77,734	I. 25,523	32.8
Net	43,308	32,138	I. 11,170	....
West J. and Brs.	85.030	77,570	I. 7.460	9.6
Net.....	23,845	Def. 4.180	I. 28,025	....
Total (gross)....	$11,002,291	$9,3 5,313	I. $1,666,948	17.9
Total (net)... ...	2,820,580	2,428,064	I. 503,683	20.7
			D. 109.067	....
Net....			I. $392,526	12.0
Two months—Jan. 1 to Feb. 29:				
Allegheny Val....	311,506	281,750	I. 29,756	10.6
Net..	134,014	90,199	I. 43,815	48.7
Balt. & Potomac.	236,447	217,655	I. 18,792	8.6
Net	84,553	63.800	I. 20,753	32 5
Cam. & Atl.& Brs	66,275	55,647	I. 10,628	19.1
Net.....	Def. 12.504	Def. 23,561	I. 11,057	....
Canadian Pac ..	1,639,199	1,154,139	I. 485,060	42.2
Net.....	69.208	Def. 47,937	I. 117.145	...
C., I., St. L. & C..	405,126	412,839	D. 7,713	1.9
Net...	139,269	163,354	D. 24,085	14 8
Cleve. & Canton.	52,903	50,016	I. 2,887	5.8
Net.	12,171	6,154	I. 6,017	97.8
Cl., C., C. & I....	1,085,514	1,077,172	I. 20,342	1.9
Net	239,633	297,795	D. 58,162	19.5
Den. & R. G. W.	179,408	142,276	I. 37.132	26.1
Net	28,903	33,849	D. 4,946	14.6
Det., B. C. & Al..	62,531	50,479	I. 12,052	23.9
Net	19,130	22,795	D. 3,665	16.1
Ft. Worth & D. C.	134,852	77,658	I. 57,194	73.6
Net	51,557	30,785	I. 20,772	67.4
Kentucky Cent...	144,010	131,423	I. 12,587	9 6
Net	51,720	44,310	I. 7,410	16.8
Keok. & West ..	53 988	48,742	I. 5,246	10.8
Net.....	13,258	16 540	D. 3,282	19.9
L., N. O. & Tex..	467,188	397,293	I. 69,895	17 6
Net	152 729	137,931	I. 14.798	10.7
Memphis & Chas.	302,558	281 621	I. 20,937	7.4
Net.....	73,659	79,380	D. 5,721	7.2
N. Y., L. E. & W.	3,938,463	3,811,725	I. 126,738	3.3
Net,.	802.071	780,313	I. 21,761	2.8
N. Y., O. & West.	215,708	176,571	I. 39,137	22.1
Net	8,595	2,639	I. 5,957	225 6
Northern Pacific.	1,649,692	1,097,149	I. 552,543	49.3
Net.....	195,386	67,323	I. 129,063	192.6
Ohio & Miss.....	595,505	606.247	D. 10,742	1.8
Net..	156.503	171,323	D. 14.820	8.7
reg. R. & N. Co.	717,845	515.099	I. 202,746	39.4
Net	164,107	88,753	I. 75,354	84.9
Pensylvania.....	8.573 433	7,840,559	I. 732,874	9.4
Net.....	2,364,203	2,594.508	D. 230,305	8.9
Pitts. & Western.	276,258	278,207	D. 1,949	0.7
Net	72,623	.....	.....	....
Tol. & Ohio Cent.	211,469	163,690	I. 47,779	29 2
Net.....	86,340	66,487	I. 19.853	29.9
W. Jer. & Brs....	170.735	154,398	I. 16,337	10.6
Net.....	25,065	19,844	I. 5,221	26 3
Total (gross). ...	$23,216,355	$18,744,148	I. $4,472,207	23.8
Total (net).....	4,860,573	4,706,583	I. 498,976	10.6
			D. 341,986	....
Net.....			I. $153,990	3.3

Three months—Dec. 1 to Feb. 29:	1887-8.	1886-7.			
Phila. & Read....	3,752,253	4,665,791	D.	913,538	19.6
Net.....	1,243,406	2,119.863	D.	876 457	41.3
P. & R.C. & I. Co	2,189,693	3,498,296	D.	1,308,603	37.4
Net... ....Def	345.334	7,623	D.	352,957	....
Total both Cos...	5,941,947	8,164,086	D.	2.222,139	27.2
Net	898,073	2,127,485	D.	1.229,412	57.7
Four months—Nov. 1 to Feb. 29:					
Ft. W. & Den. C.	282,712	176,385	I.	106,327	60.4
Net.....	111,968	84.902	I.	27,066	31.9
Five months—Oct. 1 to Feb. 29:					
N. Y., L. E. & W.	11,111,516	10,692,369	I.	412,147	3.9
Net...	2,671.785	2,752,482	D.	80,697	2.9
N. Y., Ont. & W .	612,422	503,679	I.	108.743	21.6
Net...	63,609	39,141	I.	24,468	62.7
Eight months—July 1 to Feb. 29:					
C., I., St. L. & C.	1,812,153	1,811,834	I.	319	....
Net	673,873	718.251	D.	44.378	6.2
Cleve. & Canton..	254 365	246,026	I.	8,339	3.4
Net.....	80,525	50,364	I.	30,161	59.8
Mem. & Char....	1,285.967	1,131,252	I.	154.715	13.7
Net.....	417.502	391,831	I.	25,671	6.5
Northern Pacific.	10,046,858	8,439,444	I.	1,607,414	19.0
Net.....	4,327,972	4,037,449	I.	290,523	7.2
Ohio & Miss.....	2,832,546	2,703.358	I.	129,188	4.8
Net	981.142	897,473	I.	83,669	9.3
Tol. & Ohio Cent.	825 895	654,338	I.	171.557	26.2
Net	313,811	236,957	I.	76,854	32.4
Year to Dec. 31:					
California South.	1,498.226	752,659	I.	745,567	99.0
Net	592,730	61,395	I.	531,335	....

Early reports of monthly earnings are usually estimated in part, and are subject to correction by later statements.

Traffic Notes.

The attorney general of Texas has entered a suit to enjoin the Texas Traffic Association from doing business. It is charged that the association is an illegal conspiracy and combination; that it is virtually a consolidation of parallel and competing lines and is contrary to the constitution and laws of Texas.

Little news has been published the last week concerning the rate war in the West, attention being fully absorbed by the switchmen's strike. The attitude of the Chicago, Burlington & Northern, and of the Sault Ste. Marie line as well, concerning through rates between St. Paul and the Atlantic seaboard, is still the subject of much discussion. These roads insist on making a low through rate, and the first named is understood to refuse to join in a full restoration of tariffs unless it can have the privilege of making a through rate much lower than the sum of the locals east and west of Chicago. The older lines between Chicago and St. Paul oppose this, because it will injure the business of many of their old patrons, merchants in Chicago, whose business in the Northwest would be seriously crippled by the proposed change.

The Michigan Central has reduced passenger rates from Chicago to Detroit, Toronto and Montreal. This is done to meet the action of the Niagra Falls Short Line (Wabash) in making a reduced rate between Chicago and Detroit, and also, it is said, because the Chicago & Grank Trunk has not kept its agreement.

The Chicago, St. Louis & Pittsburgh and the Chicago & Atlantic are accused of cutting east-bound rates from Chicago by absorbing switching charges to the extent of $3 to $5 per car.

Discrimination is charged against the Vicksburg & Meridian at Vicksburg, Miss., because it leases to a certain merchant an old freight house, now disused on account of a falling off in business. The lessee has an advantage in the saving of carting expenses, and his competitors consequently complain. They apparently intend to attack on all sides at once, as, according to the dispatches, they have filed petitions in the United States Court, and before both the Inter-state and the Mississippi State Commissioners.

The Chicago, Burlington & Quincy has announced a postponement of the advance in rates, and as the strikes have seriously interrupted the freight business of the road, it will quite likely be several weeks before action is taken.

Cotton.

The cotton movement for the week ending March 30 is reported as follows, in bales:

Interior markets:	1888.	1887.	Inc. or Dec.	P. c.
Receipts.....	15 875	29,299	D. 13,424	45 8
Shipments....	30.098	60,427	D. 30,329	50.5
Stock.....	262,737	143,168	I. 119,569	83.6
Seaports:				
Receipts.....	33,396	34,115	D. 719	2.1
Exports.....	56,933	77,219	D. 20,286	26.3
Stock.....	708,075	541,192	I. 166,883	30.9

Coal.

The coal tonnages for the week ending March 31 are reported as follows:

	1888.	1887.	Inc. or Dec.	P. c.
Anthracite	787.028	669.351	I. 117,677	17.6
Bituminous.....	343,938	315,249	I. 28,689	9.1

East-bound Shipments.

The east-bound through shipments of flour, grain, provisions, hides and wool for the week ending March 31 amounted to 48,091 tons, against 56,829 the previous week, and 81,220 tons the corresponding week last year:

	Per ct.
Wabash.....	4
Cincinnati, Indianapolis, St. Louis & Chicago.....	4
Michigan Central.....	10
Lake Shore & M. S.	12
Pittsburgh, Ft. W. & C	14
Pittsburgh, Cincinnati & St. Louis.....	8
Baltimore & Ohio	6
Chicago & Grand Trunk	2½
New York, Chicago & St. Louis.....	9
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ANNUAL REPORTS.

The following is an index to the annual reports of railroad companies which have been reviewed in previous numbers of the current volume of the *Railroad Gazette:*

Baltimore & Ohio.....	43	Norfolk & Western.....	98
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Chicago, Milwaukee & St. Paul.

This company reports for the year ending Dec. 31, 1887. The mileage of road was as follows:

	1887.	1886.	Inc.
Miles single track main line.....	5,670	5,298	372
Average operated.....	5,355	4,977	378

The total track, including second and third tracks, yards, sidings, etc., was 6,838 miles, of which 60 miles is owned jointly with other companies. The increase of 372 miles included the Chicago, Evanston & Lake Superior, leased for 999 years, and 182 miles of "branch-feeders" constructed. With the completion of the foregoing lines all new construction was practically finished at the close of the year, and no new work has since been authorized or undertaken by the company.

The equipment was 740 locomotives, 608 passenger, baggage, etc. cars, and 22,024 freight and service cars. The earnings were:

	1887.	1886.	Increase.	P. c.
Freight.....	$17,742 142	$17,358.294	$383,847	2.2
Passengers... ...	5,849,261	5,661,690	187 571	3.3
Mails, express, etc.	1,774,722	1,698,419	76,303	4.1
Gross earnings..	$25,366.124	$24,718,403	$647.721	2.6
Expenses.....	15,326,694	14,560,264	766,430	5.2
Net earnings....	$10,039,430	$10,158,139	D. $118,709	1.2
P. ct. of expenses.	60.42	58.90	1.52	
Gross earn.p.mile	$4,736	$4,967	D. 230	4.6
Net earn. p. mile.	1,875	2,041	D. 166	8.1

Some traffic statistics were:

	1887.	1886.	Increase.
Tons carried...	7,573,795	7,085,072	488,723
Passengers carried.	6,144,068	5,481,400	662,668
Total train miles.....	21,820,530	20,691,015	1,129,515
Op. exp'ses per train mile.	66c.	67c.	

The average price per ton per mile received for freights for a series of years past, has been as follows, viz.:

1865.....4.11 cts.	1873.....2.50 cts.	1881.....1.70 cts.	
1866.....3.76 cts.	1874.....2.38 cts.	1882.....1.48 cts.	
1867.....3.94 cts.	1875.....2.10 cts.	1883.....1.39 cts.	
1868.....3.49 cts.	1876.....2.04 cts.	1884.....1.29 cts.	
1869.....3.10 cts.	1877.....2.08 cts.	1885.....1.28 cts.	
1870.....2.82 cts.	1878.....1.80 cts.	1886.....1.17 cts.	
1871.....2.54 cts.	1879.....1.72 cts.	1887.....1.09 cts.	
1872.....2.43 cts.	1880.....1.76 cts.		

The income account was:

Surplus Jan. 1, 1887.		$8,057,734
Accrued interest.....	$3,213,578	
Old accounts charged off.....	501,037	
15 p. c. credited on act. of 57.761 shares common stock, subscribed for at par by shareholders.....	866,415	
		4,580,829
		3,476,904
Net earnings.....		10,039,436
Income from other sources.....		272,825
		$13,789,159
Interest on funded debt.....		6,456 637
Balance....		7.332.522
Dividends.....		3,257,524
Surplus.....		$4,074,999

The capital account was as follows:

Credit Items.

Capital stock, preferred.....	$21.596.900	
Capital stock, common	39,680,361	
Funded debt, including $3,401,000 of mortgage bonds issued but unsold, held in the treasury of the company.....	119.236.000	
Total credits.....		$180,513,261

Debit Items.

Cost of road and equipment.....	$177.374 430	
Cost of coal lands and mining property.	546.654	
Total debits.....		177,921.084
Excess of credits.....		$2,592 177

Assets.

Investments	$2.909.148
Material and miscellaneous accounts.....	3,493,907
Mortgage bonds in treasury...	3.365.000
Cash and accounts receivable.....	3.290,493
	$13,058,548

Liabilities.

Due on vouchers and pay rolls.....	$2,896.432	
Due for dividends not called for.... . .	66.610	
Due for interest coupons not presented.	92,844	
Interest accrued but not yet payable...	3.305,486	
Surplus income account.....	4,074,999	
Total liabilities.....		10,466.371
Excess assets over liabilities.		$2,592,177

From these figures it appears that at the close of the year the company had no floating indebtedness other than current monthly vouchers and pay rolls, and that its assets were largely in excess of all liabilities, including among its liabilities $4,074,999 of surplus income.

The report of the Vice-President points out at some length the hardships which the inter-state law has imposed upon the railroads, and adds:

"It will take another year's experience to show the extent of the injury that will result to railway property and to the public, under the fourth section of the law relating to long-and-short-haul charges, that is in direct conflict with the last paragraph of section one, requiring that rates 'shall be reasonable and just.' It will also take time to determine the extent of injury that will result from section five of the act, that prohibits agreements between transportation lines for an equitable division of traffic or traffic revenue; as it is by such agreements only that reasonable and uniform rates can be permanently secured, to prevent that 'undue and unreasonable preference or advantage' in favor of individuals or localities that invariably results from railway wars and reductions in rates below cost of service, which the first paragraph of section three, forbidding preferences, was evidently intended to provide against, and if properly enforced will certainly prevent.

"It is to be hoped that Congress in its wisdom will repeal the two objectionable sections, or so amend the law as to permit railway companies to charge rates for transportation that are in themselves reasonable and just, limited of course by the common law rule that all shippers and localities that are alike situated shall be treated alike; and also provide that the federal judiciary shall, on application, after a hearing, determine when rates are unreasonable or extortionate, and when unjust discriminations are made against localities or individual shippers. Such legislation will not only fully protect the public who must use the roads, but will give to the owners of our railways the same protection, no more and no less, than is now given under existing laws to investments in other corporate properties."

The remarkable fact is mentioned in the report that this company owns some bridges, nearly all of iron, over the Mississippi and Missouri rivers, aggregating 33,473 linear feet, or over 6⅓ miles.